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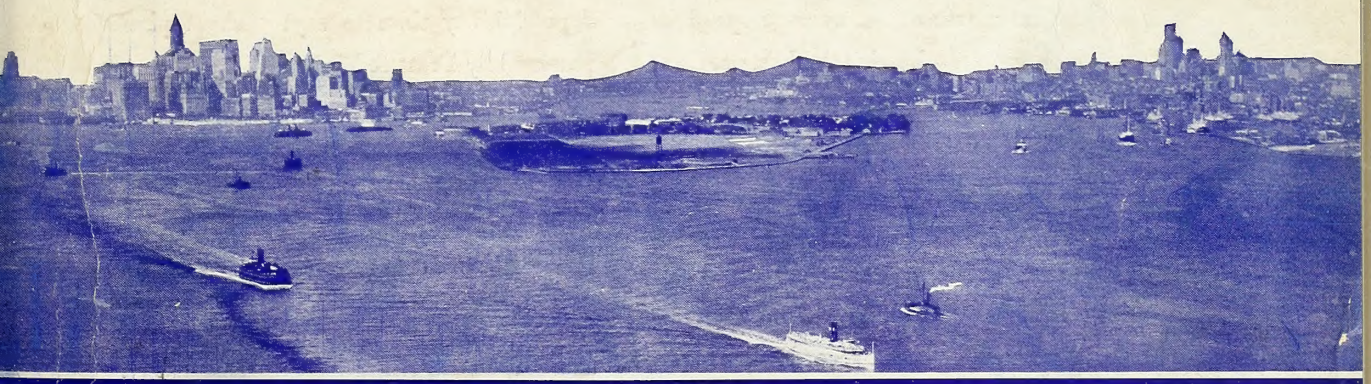
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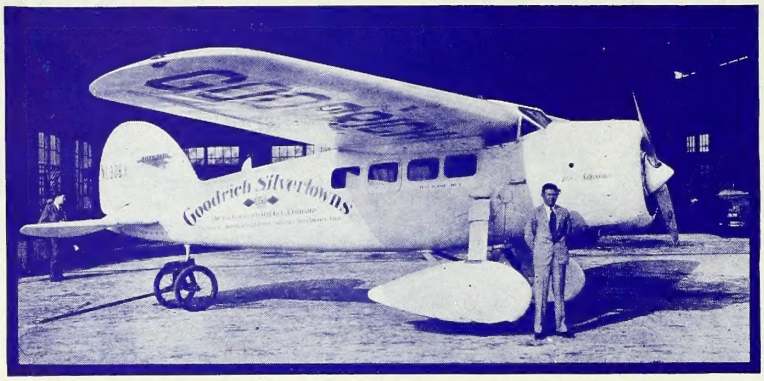
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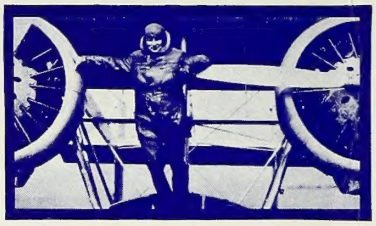
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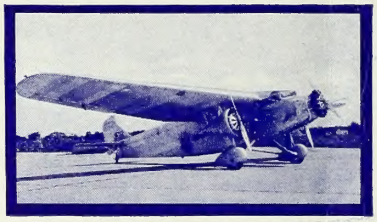
SIKORSKY WIND TUNNEL

AIRCRAFT INSTRUMENTS
Lt. Logan Ramsey

17 WORLD'S RECORDS







Above: Lee Shoenhair with his Wasp powered Lockheed—holder of six world's records. Upper right: Capt. Boris Sergievsky with his record-breaking Hornet powered Sikorsky. Lower right: the Ford, powered with three Wasp engines, in which Leroy Manning established his record for speed with load.

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*REGISTERED TRADE-MARK

AERO DIGEST, January, 1931. Volume 18. Number 1.

Published monthly by Aeronautical Digest Publishing Corp., at 220 W. 42nd St., New York, N. Y. Yearly Subscription $3. Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

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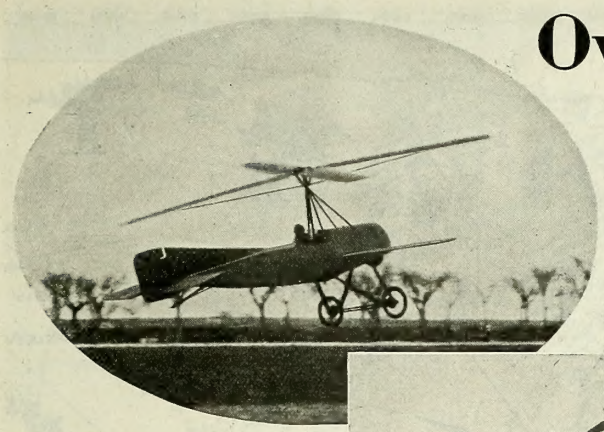
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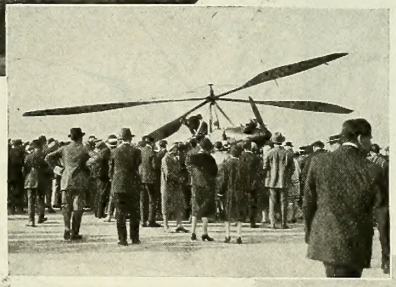
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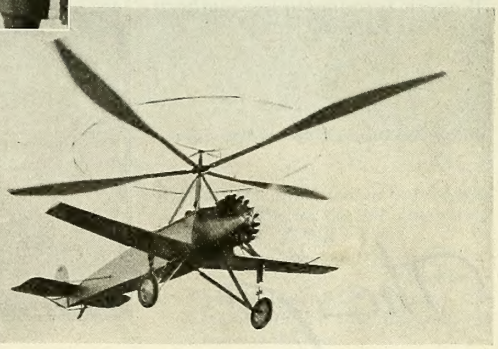
Above: As early as 1923 Cierva's work gathered momentum with the first memorable flight of the Autogiro at Madrid.

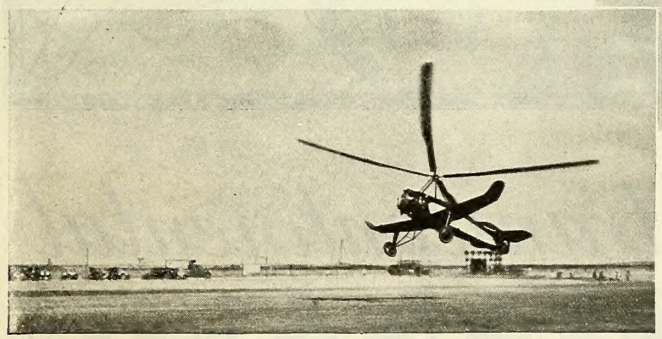


At left: 1926 was marked by successful demonstrations at the Hendon Air Pageant in England, and in 1928 an astounded world saw the Autogiro fly some 3,000 miles around Great Britain and from London to Paris, Berlin, Rotterdam and Brussels. Photograph shows Cierva at Le Bourget, Paris, after his first cross-channel flight.

At extreme right: In the fall of 1928, Harold F. Pitcairn brought the Autogiro to America. It is here shown on its first flight in this country, on December 19th, at Pitcairn Field. Pitcairn at the controls.

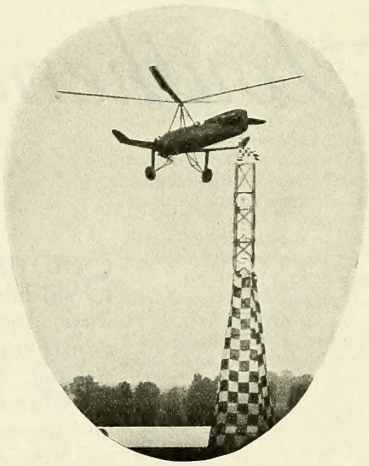
Among the Autogiro's notable flights during 1929 were the signally successful demonstration to the National Advisory Committee for Aeronautics at Langley Field and Cierva's flights at the National Air Races at Cleveland.





Above: In 1930 the Autogiro reached a stage of development which completely proved the correctness of Cierva's Theory. The Autogiro was flown by over 60 pilots here and abroad, covering thousands of air miles and so many flying hours that the practical value of the Autogiro can no longer be doubted. The photograph shows an Autogiro, piloted by James Ray, taking off at Newark after its characteristically short run.

At right: The Autogiro is here shown circling one of the Pylons at the 1930 Chicago air races, where three models made daily flights. There have followed daily public flights at Pitcairn Field and demonstrations in Washington, Trenton, Newark, Philadelphia, Detroit, New York, Cleveland, Boston, Baltimore, Atlantic City, and at over fifty important air ports in the East.

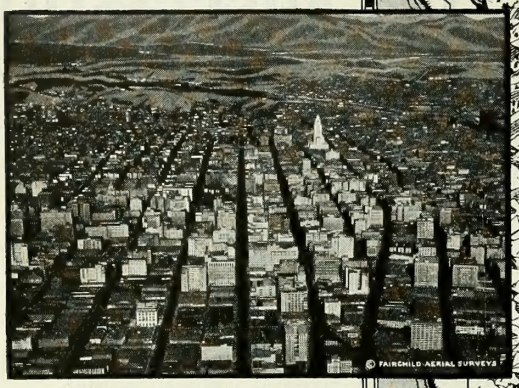


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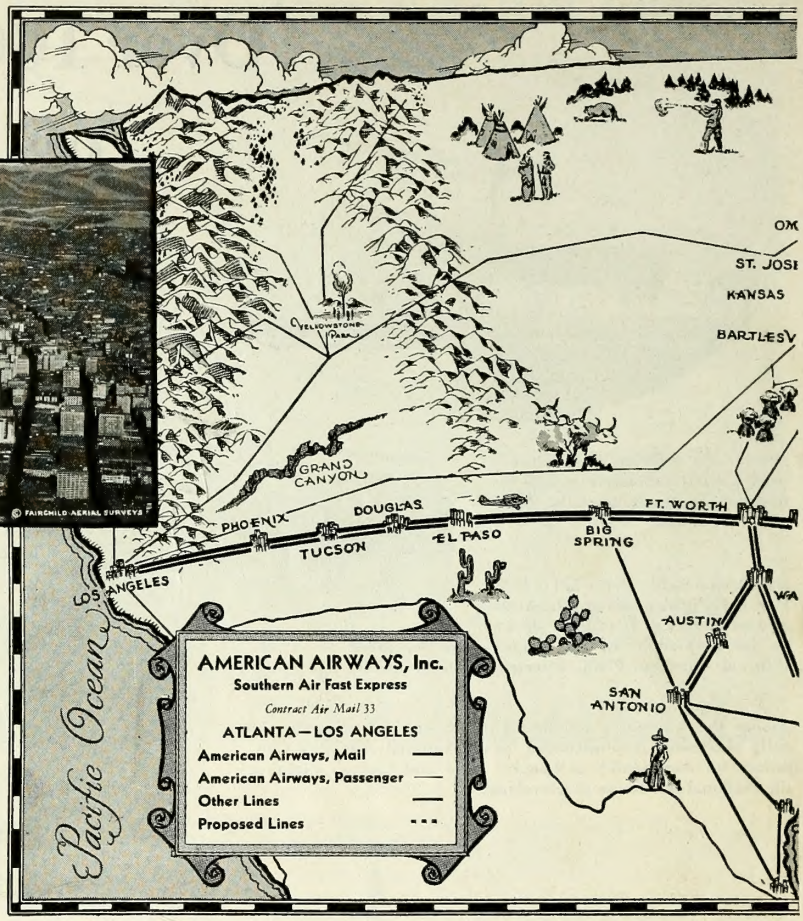
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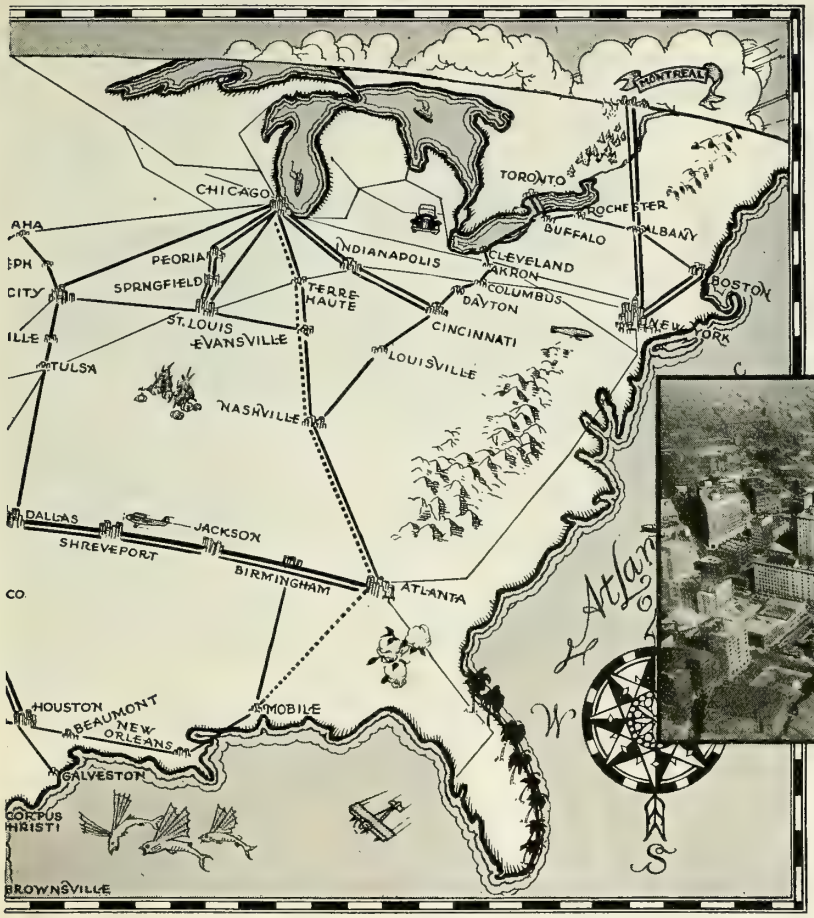
Airplane view of Los Angeles, largest city on the Pacific Coast; Western Terminal of the Southern Air Fast Express.

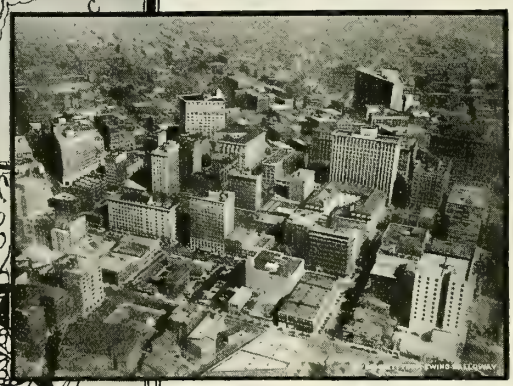


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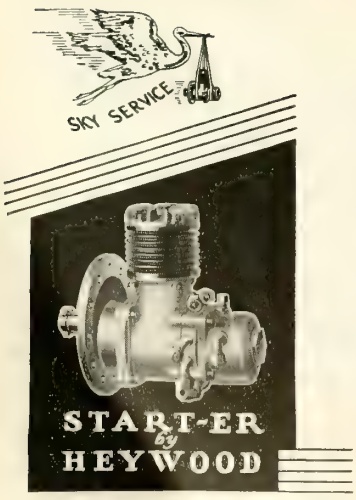


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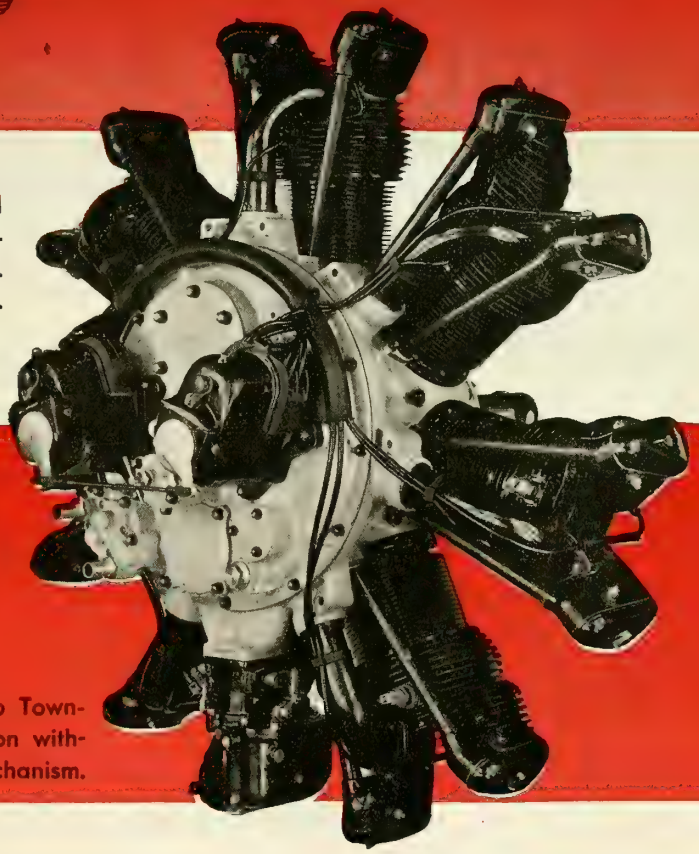
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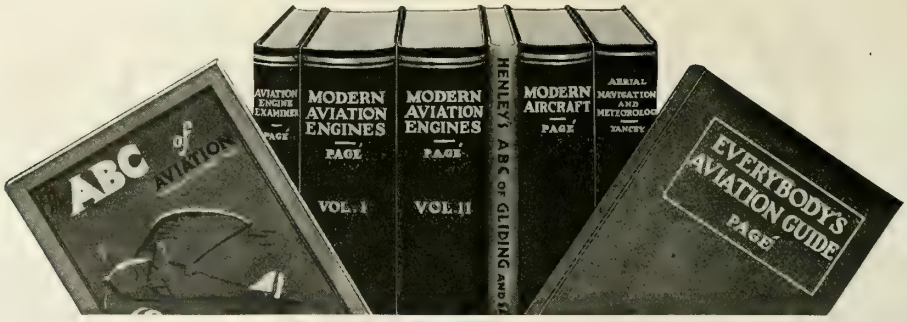
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Bronze-Back, Babbitt-Lined Bearings
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Bronze Castings
Bronze Cored and Solid Bars
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FEDERAL-MOGUL CORPORATION - DETROIT, MICHIGAN



PACKARD-DIESEL

RAISING THE STANDARDS OF AIRCRAFT PERFORMANCE

INTRODUCED less than one year ago, the Packard-Diesel has already fulfilled its initial promise to Aviation —"to give new impetus to flight." Steadily and surely it has contributed numerous and far-reaching improvements—raised the standards of aircraft performance to even greater heights.

Especially significant is the contribution made by the Packard-Diesel to the advancement of flight at high altitudes. Tests have shown that the Packard-Diesel actually gains revolutions as a ship is climbed to rarified air levels. In one demonstration the engine throttle was set at cruising speed while near the ground — and at 10,000 feet it had gained 100 R. P. M.!

This means that the relatively constant efficiency of the Packard-Diesel enables a plane to have a much higher absolute ceiling—and permits operations at high altitudes without the penalty of a radical decrease in speed. The Packard-Diesel engine automatically adjusts itself to altitude with a resultant efficiency of operation which cannot be duplicated in any other engine which requires manual adjustment for this ever-changing condition of flight.

For Aviation of today the Packard-Diesel has removed the highly dangerous and ever-present fire hazard from flying—through the use of fire-safe fuel. Its remarkable fuel economy has increased the cruising radius of aircraft and reduced cost of operation; and it has eliminated the sources of radio interference through the very nature of its design.

These improvements in aircraft power have been hailed as the most important in a generation. Today the Packard-Diesel is furnishing clean, reliable, super-power for an ever-increasing number of aircraft.

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Flying FACILITIES *that reach out*

. . stretch out from coast to coast . . service facilities for Stearman owners . . convenient, on-the-spot.

Flying needs it . . Stearman has provided it . . backed by the great, nation-wide United group.

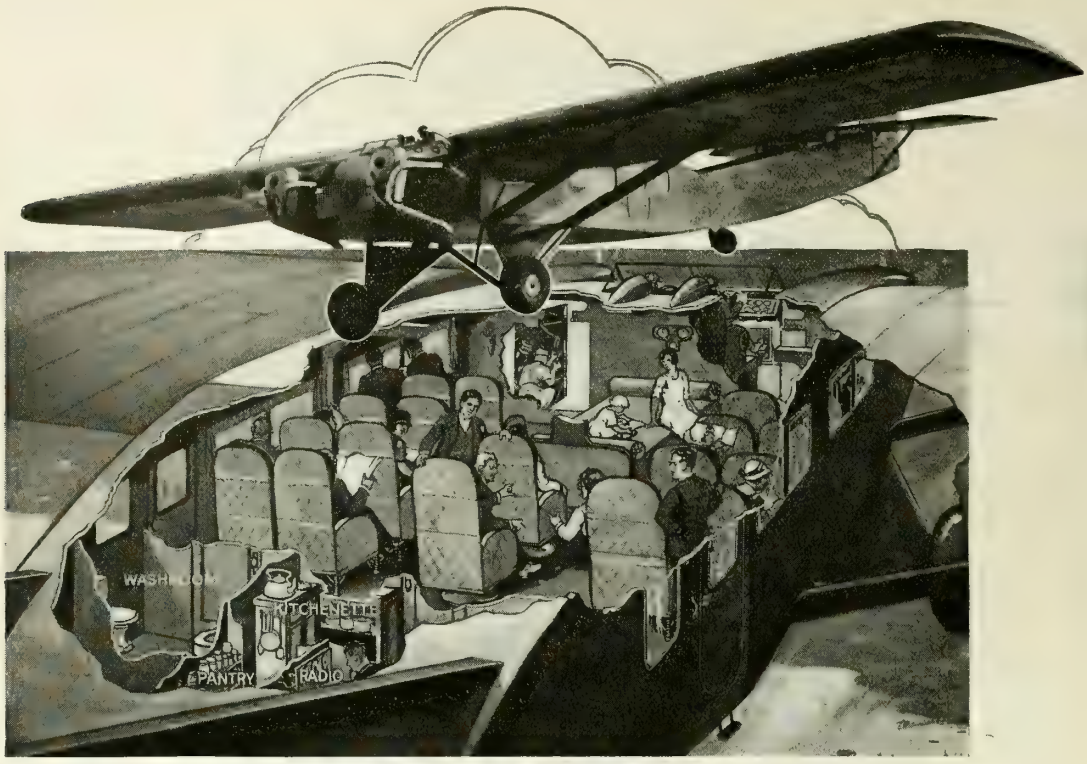


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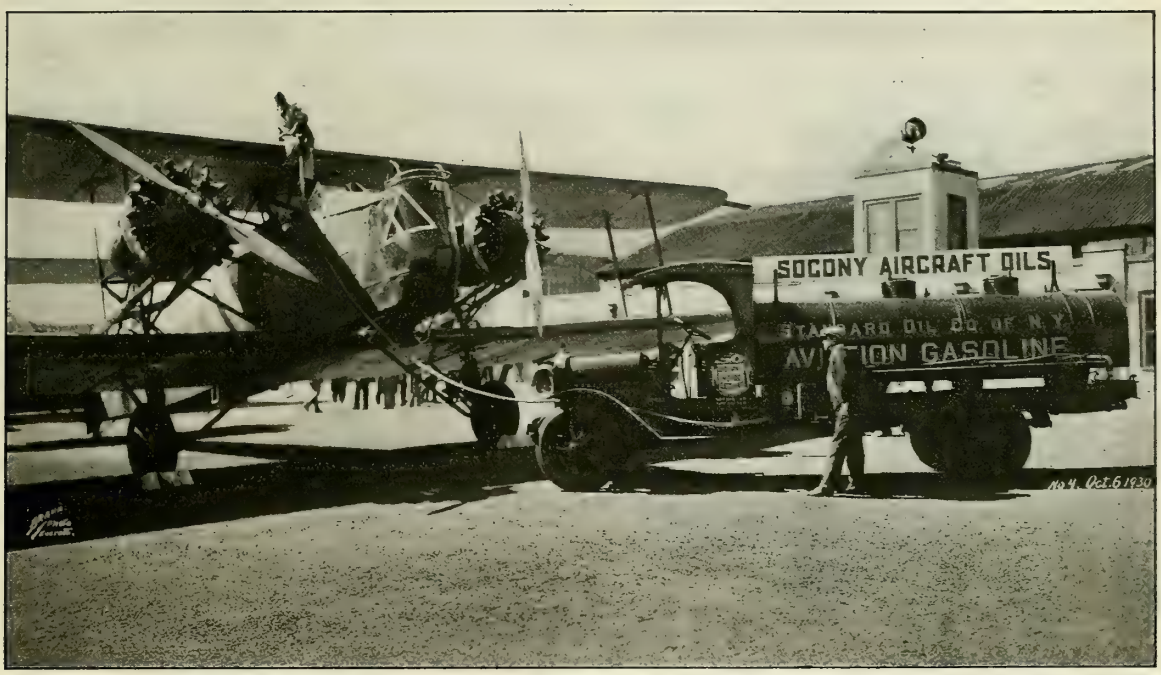
STEARMAN AIRCRAFT COMPANY, WICHITA, KANSAS — Division of United Aircraft and Transport Corporation



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PERFORMANCE
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IN this new all-metal Burnelli Transport, which has been successfully test flown for hundreds of hours and thousands of miles, are embodied qualities of safety, performance and luxury which have never before been attained in any one airplane. The comfort of a commodious and richly appointed cabin has been made secure by performance to be marvelled at and a safety of design that will outlive the durable materials used in this new-day plane's construction. A Consulting Engineer's services are available to interested parties. Write for details.

UPPERCU-
BURNELLI
CORPORATION
KEYPORT, N. J.



Keystone Panther Bomber LB-7's Twin Motor Plane powered with Pratt & Whitney Motors, 550 h. p., Keystone type, gasoline capacity 400 gallons, being fueled from a Socony Tank Wagon. This plane flew to Boston from Langley Field, Virginia.

SOCONY Aviation Gasoline

The Army choice at the Legion Convention

IN BOSTON, during the two days' aerial pageant for the American Legion, the Army Flying Service bought 7,695 gallons of Socony Aviation Gasoline.

Complete reliability, combined with smooth, steady power, has made this splendid flying fuel pilots' choice throughout New York and New England, as well as official fuel in nearly every airport.

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Try Socony Aviation Gasoline and the new Socony Motor Oil in your plane. You'll find both for sale in practically every airport in New York and the New England states.

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Motor Oil

STANDARD OIL COMPANY OF NEW YORK

WIN YOUR WINGS

IN SUNNY DALLAS, TEXAS

"Where The Summer Spends The Winter"

At the Dallas Aviation School and Air College



Miss Jean La Rene, transport pilot. Recently joined our organization as instructor. Nationally known cross country flier, and one of the few women in the United States holding a transport pilot's license.

$100,000 worth of new radial air-cooled motored ships; 50,000 square feet of hangar, shop and class room space; operating every day, 12 months in the year.

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Commercial Course	**795**
Private Pilot's Course	**385**
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- Winter climate is very mild, dry and sunny. You'll not lose valuable time on account of bad weather here!
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Why pay more? Save the difference! Enroll now! Fleets, Swallows, Eagle Rock, Commandaire, Robin, Stinson, using Warner, Kinner, Wright, J-6, J-5. Fourteen ships. The best training ship line-up in the whole country. And you can learn twice as fast in half the time.

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"A Government approved transport, limited commercial, private pilot flying and ground school"

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AND AIR COLLEGE

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Write or Wire for Our New Catalog

AN ECHO FROM THE NATIONAL AIR RACES

AND ANOTHER TRIBUTE TO

KENDALL



Ben O. Howard and the 90 h. p. "Howard" plane which he piloted in seven "fast ones" at Chicago, placing in each and winning five "Firsts"

SELDOM in air race history has a lone trio of pilot, plane and engine attempted and carried to outstanding success a racing program equalling that of Ben O. Howard at the 1930 National Air Races at Chicago. Airman Howard brought his diminutive "Howard" plane, Wright Gypsy powered, to the races determined to enter it in every race that its eligibility would permit. The rest was a matter of experienced preparation, supreme flying skill, a wide-open throttle and a crankcase of Kendall Oil. The following letter received from Mr. Howard is sufficient in itself as a word to pilots everywhere:

"I am sure that you will be interested in knowing of the important part Kendall Oil played in the successful performance of my little ship at the Chicago Air Races.

"In competing against an open field with only ninety horsepower, it was necessary that every detail be worked out carefully, and as lubrication is quite an important item, it was given much attention and consideration.

"At the start of the races I filled my crankcase with Kendall "G." This same oil is still in the motor, none having been added, after flying seven races, placing in each, of which five were firsts, together with miscellaneous flying and the return trip to St. Louis.

"At the finish of the one hundred mile 'Thompson Trophy Race,' the motor was actually turning one hundred R.P.M. faster than it had ever turned before, and the oil pressure had not dropped a pound.

"It is my belief that Kendall Oil played a major part in the beautiful performance of the little "Wright Gypsy," especially in view of the fact that the motor was turning six hundred R.P.M. faster than its maximum rating."

Whatever the opposing forces of flying—cold or heat, heavy load, necessity for speed—you may rely on Kendall. It has its source in the world's finest crude oil—the premium Bradford Grade of Pennsylvania. In Kendall refining processes every drop is assured a purity, quality and uniformity unsurpassed in the field of lubrication. Kendall Oil will give a full thirty hours of flying service without change. Merely maintain the oil level.

For complete information on Kendall quality and a list of airports where it is sold, address, Kendall Refining Company, Bradford, Penna.

BUY AT THIS SIGN PENZBEST KENDALL MOTOR OILS IT IS YOUR PROTECTION

KENDALL OIL REFINED FROM 100% BRADFORD GRADE OF PENNSYLVANIA CRUDE

NICHOLAS-BEAZLEY'S

Now Ready

IN this new 1931 General Parts and Supply Catalog we have made several changes which we believe will be for the betterment of our catalog. First, the size has been made larger and there has been a general regrouping of the various items to make it easier for our customers to make up their orders. All the new items as used and adopted by the industry are in this new catalog, and all in all it is the most complete aeronautical parts and supply catalog ever issued. Mailing will start about January to our list and, if you don't get your copy within a reasonable time . . . .

Write us and we will promptly mail you a copy

NICHOLAS-BEAZLEY AIRPLANE CO., Inc

NEW 1931 CATALOG "J"

for Distribution

New Reduced Prices on SCULLY AIR MAIL HELMETS

Because of the exceptional popularity of Scully Air Mail Helmets and their increased sales, resulting in production on a larger scale, the manufacturers of Scully Helmets have reduced the retail prices and we are the first to advertise them.

No. 94 Scully. Imported cordovan cape with beaverized lamb's wool lining, special wind-tite features; for winter flying; was $10.00, now *$7.00*

No. 90 Scully. Imported cordovan cape, summer weight, unlined; was $4.50, now *$4.00*

No. 91 Scully. Imported cordovan cape; grey suede, leather lined; medium weight; was $6.50, now *$5.50*

No. 86 Scully. White duvetyn cloth helmet with black edge binding; was $1.25, now *$1.00*

No. 93 Scully. Tan duvetyn cloth helmet with black edge binding; was $1.25, now *$1.00*

No. 92 Scully. Imported cordovan cape, lined with grey suede leather, with wool inner lining; for winter use; was $7.50, now *$6.00*

No. 97 Scully. Imported cordovan cape, lined with glove silk, seams leather taped; was $5.50, now *$5.00*

No. 2990 Scully. Imported sand grey heather cape, unlined; was $5.50, now *$4.50*

No. 2991 Scully. Imported sand grey heather cape, lined with grey suede leather; medium weight; was $7.00, now *$6.00*

No. 3990 Scully. Fine grade chamois helmet, unlined; excellent for summer wear; was $5.50, now *$4.50*

No. 3991 Scully. Fine grade chamois helmet, lined with chamois; medium weight; was $7.00, now *$6.00*

Scully Helmets supplied from stock in three sizes: small, medium, and large. Extra small and extra large supplied on orders from manufacturer and takes about one week to deliver.



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Kinner K-5 100 and Warner-Scarab 110 Propeller Specials

K-5— Ground R.P.M., 1,650 to 1,700; Air R.P.M., 1,850 to 1,900.

Through a connection recently made we are able to supply strictly high grade propellers for the 7-cylinder Warner-Scarab 110 hp. or the 5-cylinder 100 hp. Kinner K-5 at a price which will be a very substantial saving to you. These propellers are finished in natural wood, varnished and newly copper-tipped. They are 7'6" diameter and less spinners. They are sold to you with strict guarantee as to workmanship, materials and performance and on a money-back guarantee if not fully satisfied. A spare propeller oftentimes saves you time and money and at a price we offer these you can easily afford one. Each $29.50

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We guarantee DEPT. OF COMMERCE APPROVAL on every one of these propellers sold.

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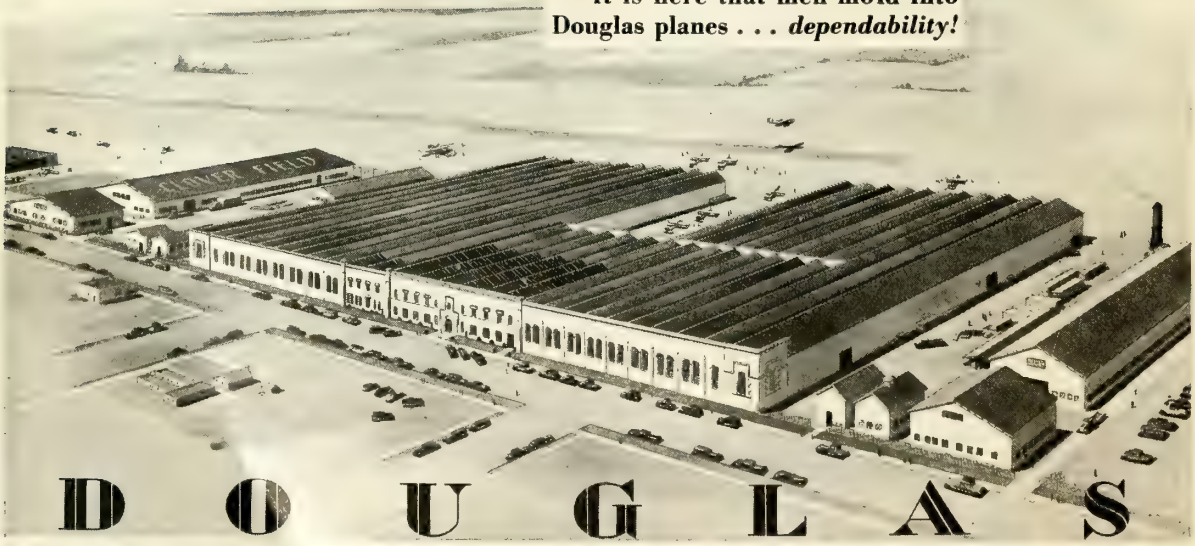
Dependability

THE consistent performance of every Douglas plane has been due in no small way to the design and construction of all Douglas aircraft.

Too, the name Douglas, pictures in many minds a wholly dependable form of air transportation, perhaps one can also visualize a factory, less clearly, for the Douglas factory has grown quietly in the background . . . of Douglas achievement.

Yet the Douglas factory reflects in actuality all that has been accomplished. This story of the Douglas plant is no less important than the story of Douglas dependability for the two go hand in hand. It is because of the inspired work of Douglas executives and engineers, the plant is here. And under its roof Douglas craftsmen have worked a little harder to mold into Douglas planes a perfection of detail well above the standard practice of aircraft construction.

It is here that men mold into Douglas planes . . . *dependability!*



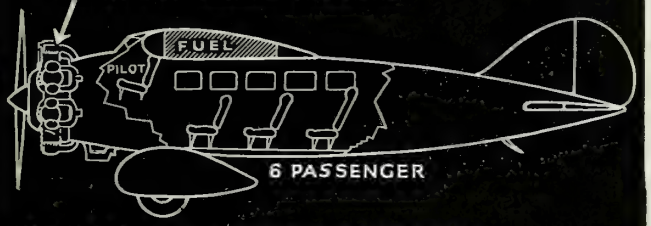
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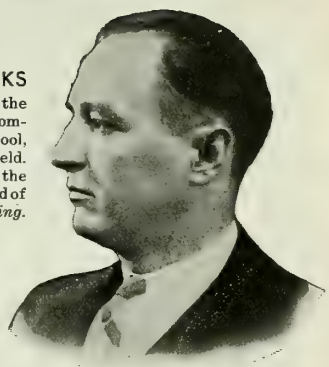
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135 M. P. H. CRUISING SPEED. FULL LOAD DIRECT OPERATING COST, 4c PER PASSENGER-MILE.
FLYING TIME, ST. LOUIS to NEW YORK, 11 HRS. FARE $65.00.
AVERAGE LOAD—3 PASSENGERS.
ACTUAL OPERATING COST PER PASSENGER-MILE, 8c.
OPERATING LOSS—1½c PER PASSENGER-MILE.
ONE SHIP PER DAY, EACH WAY.

OLIVER L. PARKS founded and built the world's largest commercial flying school, foremost in its field. He speaks here of the future of flying and of *your future in flying.*



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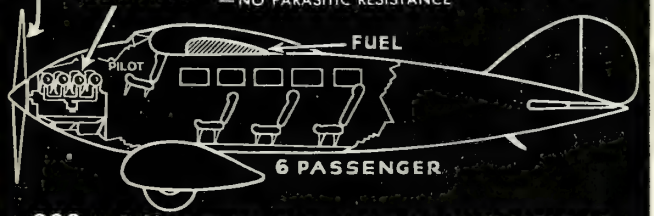
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BY PLANE TODAY	11 Hours	$65.00
BY RAIL (*Fastest train with Pullman*)	23 Hours	$54.94
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Saving over today's plane—**5 hours**—**$28.50**
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The PASSENGER SHIP of 1931

NEWLY IMPROVED PROPELLER WITH 3 TIMES THE PULLING-POWER OF PRESENT TYPE

220 H. P. FULLY INCLOSED PERFECTLY STREAM LINED MOTOR—NO PARASITIC RESISTANCE



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AVERAGE LOAD—6 PASSENGERS.
ACTUAL OPERATING COST PER PASSENGER-MILE, 2c.
OPERATING PROFIT, 1c PER PASSENGER-MILE.
ONE SHIP EACH HOUR, EACH WAY.

AVIATION steps forward in 1931!

5 TIMES AS MANY AIR LINERS—5 TIMES AS MANY TRANSPORT PILOTS—10 TIMES AS MANY MECHANICS

Look ahead six months—no more. Aviation calls for a new deal in 1931—the whole picture of flying will be changed. If you're going to be in on it, you've got to say "Go!" today.

St. Louis to New York in 6 Hours, Non-Stop!

That's the 1931 program, to be achieved by new-day ships, triumphs of design, perfectly streamlined for speed . . . 200 miles an hour cruising speed will be attained . . . less gas and oil to be carried . . . less wasteful resistance . . . less power required . . . lower rates because of lower operating costs . . . and full seats instead of empties . . . . . *that's commercial flying as you'll see it in 1931!*

It means new life for Aviation; a five-fold increase in opportunity. Are you coming in on it? All you need is Parks training, at the school where vision guides every activity, under the men who were first to see the future as it is pictured here.

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WORLD'S LARGEST COMMERCIAL FLYING SCHOOL

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On America's new need for speed, Curtiss-Wright is building a brilliant future for Flying and a practical, progressive present as well. For the Travel Air "Mystery S" and the Curtiss "Hawk" are ships that streak across vast distances at speeds of from 3 to 4 miles a minute!

Both planes have proved these speeds not in short racing laps but in sustained cross-country flight, in hundreds of take-offs and landings, on errands of *practical air transportation.*

Al Williams in his "Hawk" beat by 1 second the take-off of a plane built for near-vertical ascent. His "Hawk" leaped off the ground in 4 seconds—and 1 minute later traveled faster than 200 m.p.h. at a 2700-foot altitude.

Frank Hawks in his Travel Air "Texaco 13" has not only repeatedly hit speeds never before attained in air transportation, but he has *succeeded in shrinking the American map to the size of a state like California or Texas.*

Big business and national defense have awaited speeds like these. And, because its wide, well-balanced line *anticipates* each forward stride in Aviation, Curtiss-Wright is a name you can depend on, a name that will help you grow!

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AIRPLANE COMPANY

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1931 MODELS AT SLASHED PRICES

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A low priced but warm flying suit that sold as high as $29.50. Single breasted, completely lined with wool felt ¼ inch thick. Ideal for mechanics and students. Zipper equipped; heavy wombat 5 inch collar. This suit is made of same materials and to identical specifications as our $18.95 suit, with the exception of a finer lining of the best virgin wool blanket felt. A warmer and better suit at a low price.

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Soft leather; lined; powder puffs.

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Size, please

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Front Zippers,	$8.50
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Genuine Bass, Back Zippers and Front Lacing,	$15.00

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WARM GLOVES

Black leather, five fingers, warm wool lined	$3.50
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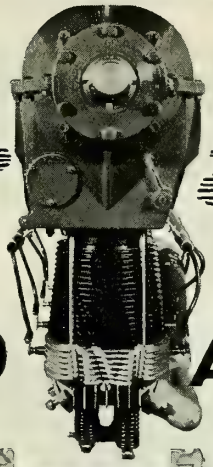
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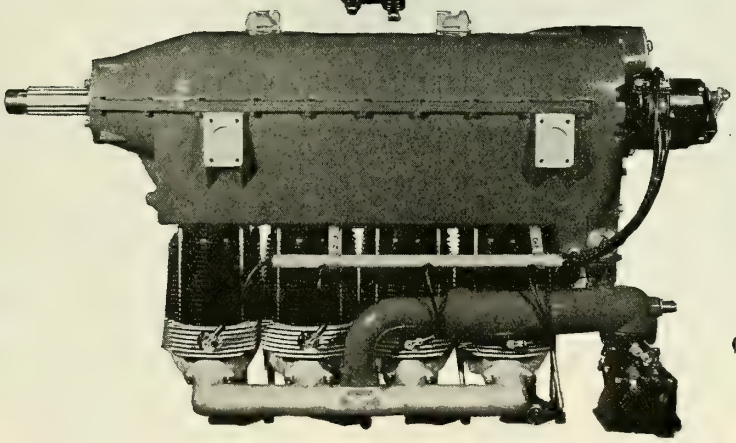
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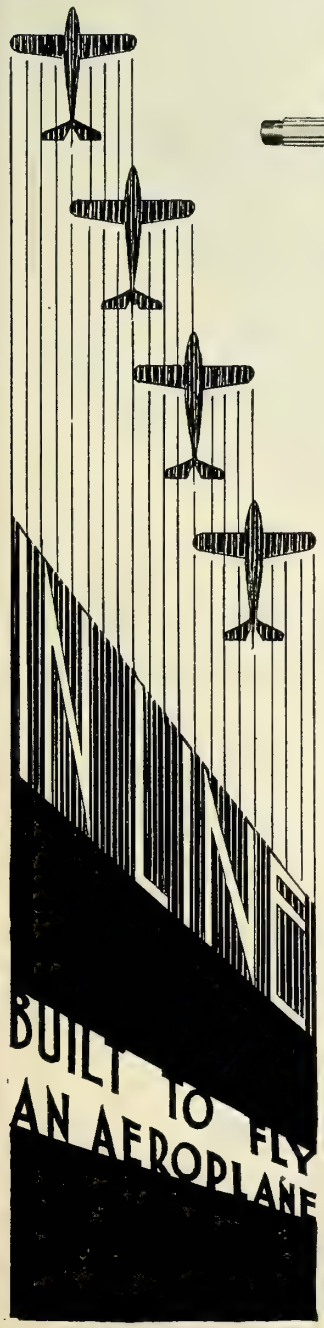


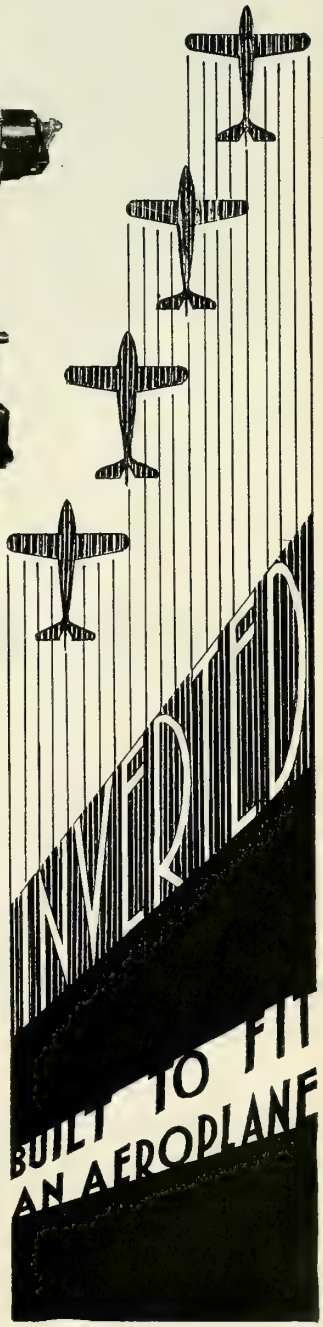
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American Eagle offers its thoroughly modern AMERICAN EAGLET!
A two-place, featherweight airplane with dual controls, designed and built to sell at a price all can afford and afford to fly.
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ASPHALT *for* AIRPORTS



PORT COLUMBUS AIRPORT, *Columbus, Ohio, showing Asphalt landing field and runways.*

The same Field from an elevation of 2000 feet.

TYPICAL INSTALLATIONS

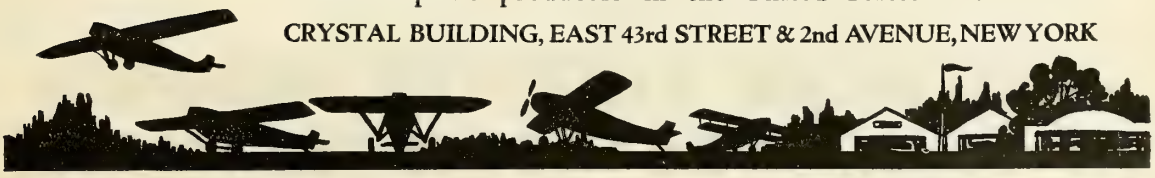
Amarillo, Texas, Municipal Airport
Central Airport, Camden, New Jersey
Detroit, Michigan, Airport
Fairfax Airport, Kansas City, Kansas
Mather Field Airport, Sacramento, California (1918)
Port Columbus Airport, Columbus, Ohio
Saint Paul, Minnesota, Airport
United Boeing Airport of Los Angeles and Burbank
Valley Stream Airport, Long Island, New York

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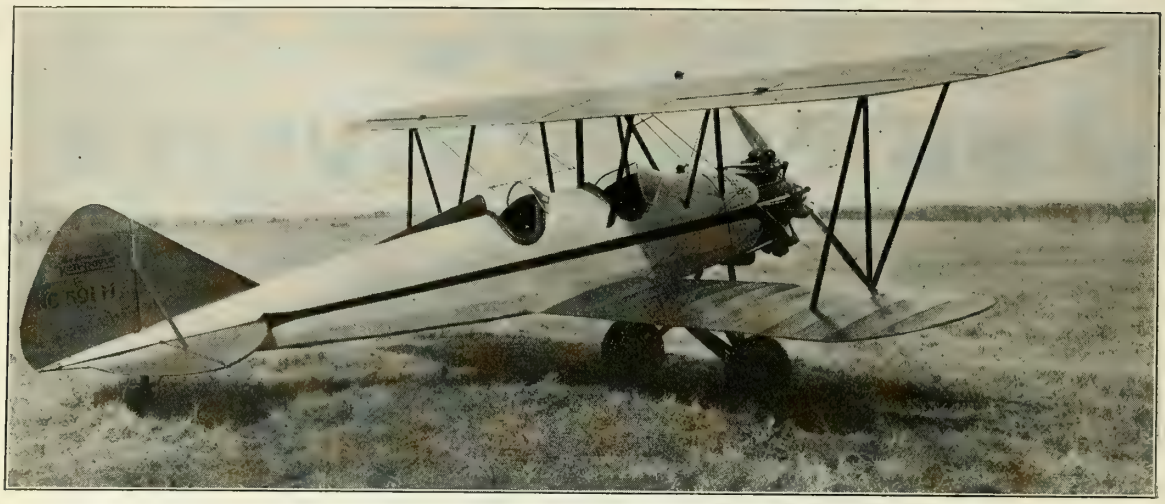
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Among other races won by the Ken-Royce at the National Air Races at Chicago last August, the Sportsman's Pilot Race, event No. 42, was captured by C. B. Allen, well known reporter for the New York *World*. His ship was a stock Rearwin Ken-Royce with no special cowling or other racing equipment. A beautiful trophy was awarded by the Chicago Athletic Club.

REARWIN AIRPLANES INC.

FAIRFAX AIRPORT **KANSAS CITY, KANSAS**

Talking About Speed!

BY

E. B. GALLAHER
Treasurer, Clover Mfg. Co.
Editor, Clover Business Service

You know, rabbits *think* they are some runners; but, when the colored Deacon, walking through a graveyard one dark night, was startled by a white object jumping out at him, he started to run down the road—Mr. Rabbit right in front, but not going fast enough to keep out of the way, the Deacon yelled out, "Git one side there and let a fellah run w'at KIN run."



I can't help getting a good laugh at the expense of the bunch who have been yelling their heads off about the alleged "speed" of certain water-mixed valve compounds, and the "passing" of grease mixtures; **for, now come the long-awaited Government findings and specifications, dated May 1st, 1928, governing future purchase of abrasive compounds and knocking all this bunk into a cocked hat.**

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From the cabin of the Lockheed Vega owned by the Detroit News, Photographer William Kuenzel's camera records the quiet majesty of Nature and the clamor of human events

ADAPTING the AIRPLANE TO THE NEWSPAPER



A Report Covering An Experiment Conducted by the Detroit News

By
James V. Piersol
Aeronautics Editor
The Detroit News

WITH the utility of the airplane established, there comes the widening of its usefulness, its application to everyday affairs. In addition to its transporting passengers, mail and merchandise over the beaten path of the established airways, the airplane has been partially tried in numerous remote places in occupations ranging from fishing to farming. In its major field, where it is rapidly taking the status of a common carrier, much valuable information has been compiled and broadcast. But its application to the individual business has been comparatively neglected, and it is to add something useful to the record of experience in this field that this report is published. For the most part the report covers the operations of only one airplane and one business, but it is based on precise records and indicates what may be expected of aircraft in any business. Further, considering that this experience comes of an airplane's coördination with a metropolitan newspaper whose requirements for quick action and accuracy are most exacting, the results attained are indeed encouraging.

* * *

THE Detroit *News* recently completed a year's test of airplane operations which reveals many interesting facts concerning the adaptation of air transport to the publication of a newspaper. During the period of the test, 45,961 miles were flown on 141 assignments which included news stories, aerial photography and the distribution of papers. The assignments involved 388 flights which took the plane into twenty-nine states and two Canadian provinces. All but three assignments were accomplished without a moment's delay, and there was only one assignment that could not be undertaken.

This test period was preceded by other experimental flights which began in 1912 when William E. Scripps, president of the Evening News Association, publisher of the *News,* purchased and piloted the first privately owned "flying machine" in Detroit. His pioneering was later followed by numerous experiments in which air service and airline operators were hired by the *News* for various tasks. The early flying done by Mr. Scripps demonstrated possibilities for the paper. The later experiments, leading up to August, 1929, were useful, and indicated that an air transport division of the paper similar to its automotive division might ultimately be desirable. With this in view, the degree of dependability, the cost of operating aircraft and the specific requirements of the paper were to be further defined.

Already there was an occasional demand for the speedy distribution of papers at distant points and immediate aerial service was rarely obtainable. The aeronautics editor was flying from 10,000 to 20,000 miles a year to report aviation events, and his traveling accommodations were rarely operated on schedules that could be timed to the paper's press schedules. Detroit was experiencing a rapid expansion. Numerous highway and building projects were to be shown and aerial photography offered a new and better medium. Occasionally a big news event required fast transportation of reporters and photographers to a distant point.

This was the situation when the decision to purchase a plane was reached. To arrive at the selection of a plane numerous factors were considered. The amount of papers to be carried was arbitrarily settled at 500 pounds. A closed cabin was necessary from the standpoint of comfort and photography. Also a cantilever monoplane was necessary so there would be no lower wing or wing struts to restrict the range of the camera. Added to these and other general requirements was speed—the major requirement.

On a basis of these essentials, a Lockheed Vega powered with a Pratt & Whitney engine of 450 horsepower was selected.

Then came the matter of equipment. Because news has no regard for time or place, landing lights and other night-flying equipment were added. Special aerial cameras and accessories were made a part of the airplane equipment. Blankets, emergency rations, parachutes and other provisions were added for safety and comfort. Pontoons were added for landing on water and skis for landing on deep snow.

Finally, with a total initial investment of $27,709.50, the plane became a ship-of-all-work, equipped to fly to the Arctic or the tropics on short notice. Frank Byerley, an Army Reserve officer with both military and commercial training, was chosen to pilot the plane. Operating plans and policies were placed under the direction of W. S. Gilmore, managing editor, and the plane was put into service on a fire department operating basis—ready for action at any time of day or night.

One of the airplane's first assignments took it to Cleveland for the National Air Races. There, photographs of the field, the crowd and the participants in some of the early events were taken and rushed back to Detroit for publication the same day. Then the plane proceeded to Pontiac airport to photograph Capt. Frank Hawks taking off for Cleveland on his first cross-country flight in a glider.

The next day the plane was put on pontoons for the International Boat Races on the Detroit River. Aerial photographs were made of the race and, as reproduced in the paper, gave spectators an unusually comprehensive picture of the course and the events.

Next came reports of a forest fire in northern Michigan. From several sections of the state, cities were reported in imminent danger of destruction. Reports from other sections were less alarming. There were conflicting reports and uncertainty as to the exact extent of the fire. Many of the fires were reported in remote places where there was valuable timber and no communication. The only way to find out the extent of the fires was to see them. They were scattered over more than 1,000 square miles. Consequently, a reporter and photographer were sent out in the *News* plane. Within one hour they were over the fire area, inspecting it first hand. Twice the plane landed for the reporter to telephone his story to the paper. Within four and one-half hours the plane had flown 768 miles and returned to Detroit with photographs and a first-hand report.



In 1912 William Kuenzel made the first aerial photograph of Detroit. Walter Brookins (left) was his pilot

An old settlers' picnic in a distant farming community was next to call the plane. A reporter and photographer were landed near the picnic and while they gathered news of the proceedings the plane hovered overhead to photograph a parade and a placid scene recalling the ox-cart days of Michigan.

Next there came a flood. A Nor'easter whipped the Great Lakes to fury. Hundreds of homes and thousands of acres of land were flooded overnight. Quickly the plane was in the air and aerial photographs were in the paper, chronicling the plight of the stricken districts in a way that could not otherwise be equalled.

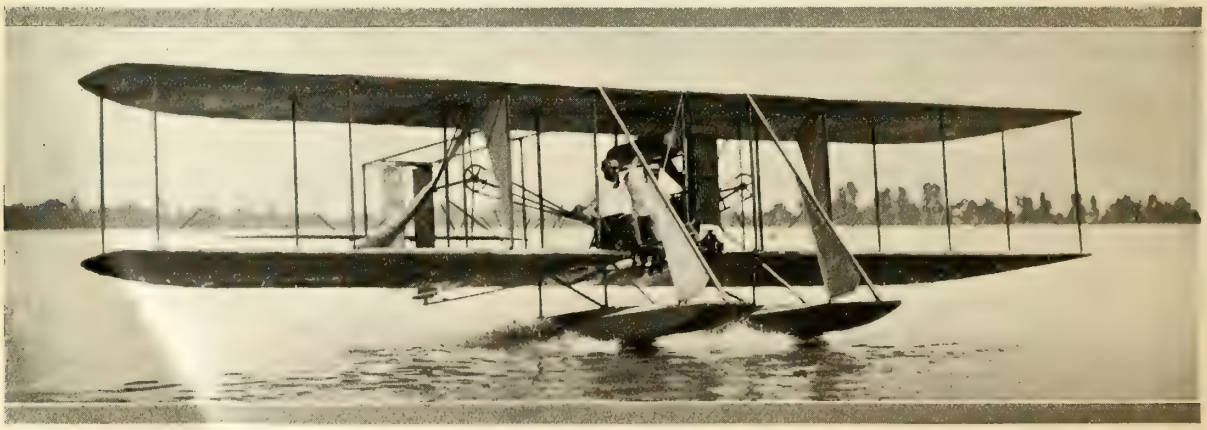
One night there was a shooting. When the smoke cleared away the wife of a prominent contractor was accused of murder. She accused her husband. He accused her. Gradually there was unfolded a story of intrigue, infidelity and mystery. The story gained nation-wide circulation. The trial came. There was a witness, a woman, missing. She could not be found, but in the course of the trial her hiding place, 300 miles away, leaked out. Almost the moment it was known, the *News* plane was in the air with a reporter and photographer. And her story was in the paper soon after.

Four hundred members of the Detroit Board of Commerce sailed one evening in June for their annual cruise on the Great Lakes. Next afternoon, about the time they began to wonder how the market was going and what was happening at home, the *News* plane overtook them on Lake Huron, 290 miles from Detroit. It alighted alongside and unloaded 400 papers with the closing market quotations and all the news of the hour. The papers were received with gratitude, but that was the least of the plane's utility on this occasion.

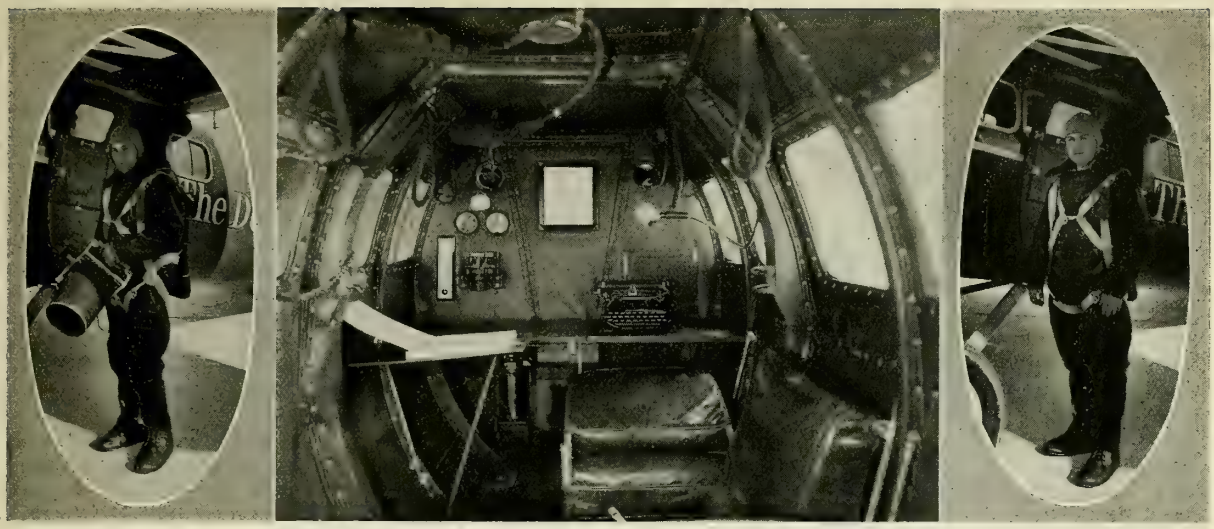
At the moment the plane landed. A. Blair Moody, Jr., a Detroit *News* reporter who had embarked with the cruisers to write the story of their trip, lay in his bunk below decks stricken with acute appendicitis. Not expecting the plane, the captain had radioed for an ambulance to meet the ship at the Straits of Mackinac. That was hours away for the ship but only a few minutes for the plane, and an operation was urgent. Mr. Moody was transferred from the ship to the plane and flown ashore where the operation was performed at a time when delay might have been fatal. The airplane returned to Detroit and continued the distribution of papers for the duration of the cruise.

At every turn in the early stages of the test the airplane was on trial. For some time after the success of its initial flights, there was still an occasional note of doubt as to whether the plane would stand the pace of the paper. On one ocasion it was sent to Indianapolis for photos of an automobile race. The race was the annual 500-mile speed classic, and Detroit had never seen photographs of the event in the paper on the day of the race. Orders were issued to run an extra.

Everything was set to get the paper on the streets at a predetermined time, but nothing was said about it until the plane had landed. The plane was the only cog in the wheel the reliability of which was questioned. The paper had been running extras for fifty-seven years; everything else was certain to work. So, as soon as the plane brought



William E. Scripps, publisher of the Detroit News, in 1912 purchased a Burgess "hydroplane," the first privately owned plane in Detroit



Only experienced personnel, working with the most complete equipment, can qualify in the aerial service of a modern newspaper The Detroit News chose William Kuenzel (left) as photographer, Frank Byerley (right) as pilot, and a Lockheed Vega plane

in the pictures, the forthcoming extra was announced over WWJ, the *News* radio station. But it was fully two hours before the extra was off the presses when it should have been off in a few minutes. When an investigation was made to locate the trouble, it was found that the plane was fifteen minutes ahead of schedule, but another department with nearly half a century of experience had slipped. After that there was not so much concern about the plane, and its operation finally became a part of the paper's everyday affairs.

At the conclusion of the test period the airplane's 141 assignments were divided into four categories for analysis. Sixty-one were placed in the category of routine affairs. Three assignments included flights to contact airports, aircraft factories and other news sources. In this work the plane was periodically piloted by the aeronautics editor to test the condition of the plane and to contact news sources.

Thirteen of the assignments came under the category of calendar events. These called for aerial photographs to be made and filed for publication coincident with an event to transpire later. This included photographs of new buildings to be opened on a certain date, the dedication of an international bridge and the opening of a new highway. On one of these assignments, a photograph was made from 18,000 feet, showing 400 square miles including Detroit and the vicinity.

Fifty-seven times the plane was used on "spot news" assignments. These included the Columbus, Ohio, prison riot in which 320 prisoners were shot or burned to death, the Indianapolis race, rum running activities, several big fires, the National Air Tour and the National Air Races.

The fourth category includes ten special assignments. Among these was a search for a missing ship on the Great Lakes and the delivery of pine tree seedlings in connection with a reforestation program sponsored by the paper. In the delivery of the trees, 30,000 seedlings were transported from the state nurseries at Lansing to the planting grounds in the northern part of the state. At the same time aerial photographs of the planting were made for publication, and the plane thus served two purposes in one assignment.

Other combination assignments in the "special" category included sending the plane to Florida for pictures of the opening of the Detroit baseball team's spring practice. For the trip, the course was laid out in a round-about way to get photographs of numerous cities, Government works and monuments of national importance. In one day the plane covered 1,000 miles and was in the air seven hours and thirteen minutes. During that time it was the means of making eleven striking aerial photographs which included the birthplace of Abraham Lincoln at Hodgenville, Kentucky, the power development at Muscle Shoals, Alabama, and Lookout Mountain at Chattanooga, Tennessee.

The following day brought photographs of prominent winter resorts where there were numerous Detroiters. The route was laid out and timed for the arrival of the plane at Tampa coincident with the opening of baseball practice. As soon as the Tigers were in their uniforms the plane was on the way back to Detroit. The pictures



News has no regard for time and place, and the airplane in quest of it must be able to operate from land, water or snow



The News fliers find many interesting events and scenes to photograph from the air: Top to bottom, Niagara Falls, the Columbus, Ohio, prison after the fire and outbreak, a Michigan flood and the annual automobile race at Indianapolis

of the ball players and the scene of practice were in the paper the next day, thirty hours ahead of any other Detroit paper. This was followed by additional photographs of the players and Southern scenes published in the rotogravure section the following Sunday.

The aerial photography was done by William A. Kuenzel, manager of the photographic department of the Detroit *News*. During the year's test, 173 aerial photos were published in the various sections of the paper. In addition, 113 were used in the paper's institutional advertising. At the conclusion of the test period more than 500 additional pictures were on file for use in the future.

Among the numerous inquiries regarding our experience there have been four dominating questions, including the dependability, service, cost and advertising value of operating the airplane. The substance of each question and the answer is as follows:

(1) *Is the airplane dependable?*

Only three times was there any delay in carrying out the 141 assignments. Weather conditions delayed two. On one occasion the pilot was occupied elsewhere, causing a delay of one hour in locating him. The one assignment which could not be undertaken called for the plane to take off on bare ground and to land where there was several feet of snow. The skis could not be used to take off on bare ground and the snow was too deep to permit the plane to land safely on wheels. Tests of a combination of ski and wheel which is designed to eliminate this difficulty are now scheduled.

(2) *Do the aircraft companies provide prompt replacement and repair service?*

During the test period there were seventeen days in which the airplane was tied up for replacements and repairs. Seven days were occupied by work on the engine and ten days by work on the plane. Other factors made maintenance complicated, and our experience in general showed there is little provision for repair and replacement service for the owner of the individual plane. When it came time for an engine overhaul, we had our choice of flying the plane 165 miles to the nearest authorized repair station of the engine manufacturer or imposing on an airline operator to get the work done. When it came to the replacement of airplane parts and accessories, they had to be shipped anywhere from 100 to 2,000 miles, or be made by hand at considerable expense.

However, the lack of prompt service is not to be taken as a reflection on the makers of our particular plane or engine, or on the other fifty-nine manufacturers whose products are a part of our flying equipment. We believe this condition is general in the aircraft industry. We acknowledge it in answering numerous inquiries on this point, as a matter of fairness to the aircraft makers, owners and potential owners who want to know the shortcomings of airplane ownership so that they can be overcome. Further, lack of prompt service is emphasized because we believe it is the greatest single hindrance to the adaptation of the airplane to individual use. Service has improved considerably in recent months, but we believe the lack of it still is the cause of ninety per cent of the dissatisfaction among individual owners. There must be much greater improvement before planes will be numerous in everyday affairs and before the aircraft industry will fully develop.

(3) *What is the cost of operating a plane?*

The cost of operating the *News'* plane during the test period was sixty-two cents a mile. This figure includes the pilot's salary, the salary paid a mechanic's apprentice, complete insurance coverage, depreciation, hangar rent and all

other items involved in maintaining and operating the plane. This figure is considered high in some quarters and low in others, and it is not to be taken as a standard of measurement. Costs vary according to the size, horsepower and performance of the type. Some planes can be operated for considerably less than this. Others cost three times as much. There is a variation in every case. In this case the cost of operation probably is a little more than the average of the same type because of its exacting work and the maintenance of special equipment required to keep the plane ready for safe and speedy action under all conditions.

(4) *Aside from the service rendered by the plane, do you consider it good advertising or of any other value?*

In a merchandising sense it is not advertising. However, the use of a plane has features that may be interpreted as advertising. Some of them are good advertising and some of them bad. All of them are involved in its appearance and use. This airplane was painted according to a carefully drawn color scheme dominated by a peculiar shade of red. A similar color was in use on the paper's automobiles and other vehicles for many years. But it was simply red. Within the last six months, however, one of the country's largest paint manufacturers has put a special aircraft lacquer on the market and labeled it the Detroit News Red.

The plane was named after the paper, and its name was painted on the fuselage. The wing bore the word NEWS. Thus it was easily identified, and it is estimated that more than 3,000,000 persons saw it close enough to read its name. When it was seen loading or unloading reporters and photographers to cover an important news event, when it was seen loading or unloading papers, whenever it manifested a usefulness of any kind, the publishers and editors received considerable favorable comment. On other occasions the public's reaction was not favorable.

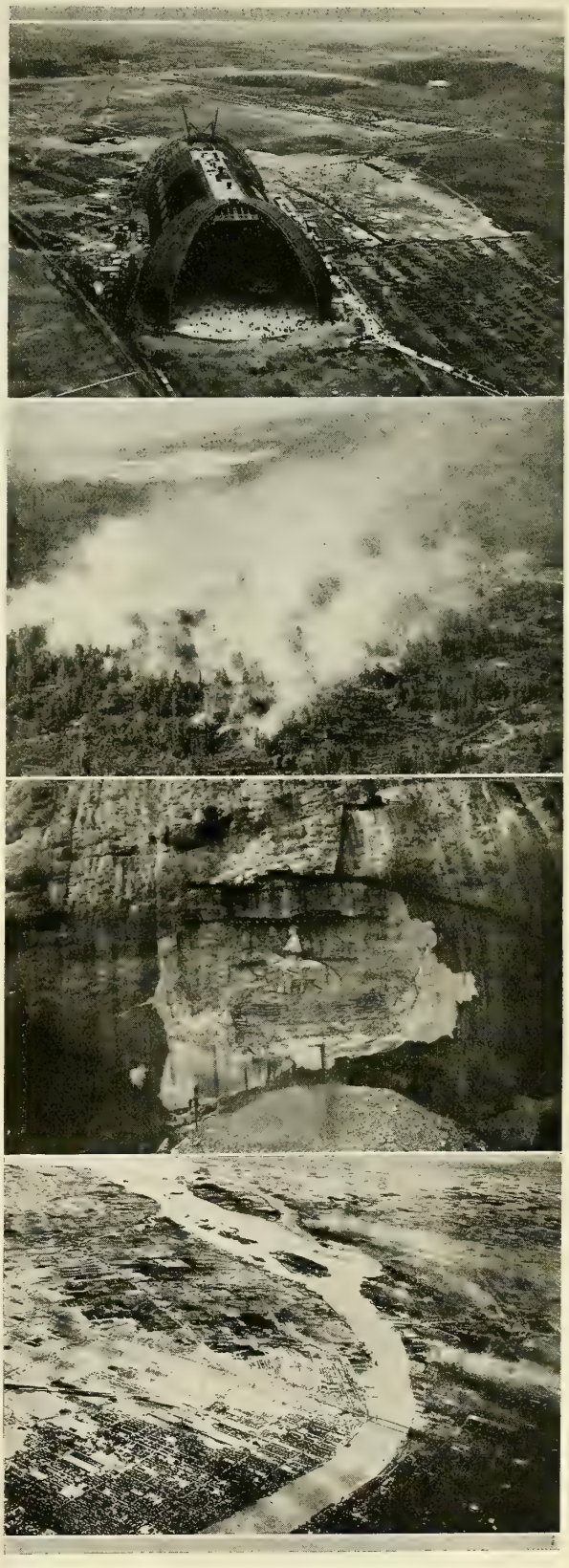
The plane was often over airport crowds and other gatherings which figured in the news of the day. The pictures made from it often brought favorable comment from the paper's readers, but not always. On one occasion the plane was flown around a stadium containing 90,000 persons attending a football game, and the pilot flew a little lower than usual to satisfy the photographer. He was above the minimum altitude prescribed by the air traffic rules and outside the rim of the bowl, but the audience sensed the fact that he was closer than necessary and the paper received numerous protests. At other times, when the plane appeared to be idle there were whispers of waste—an expensive luxury.

These experiences bring us to the conclusion that the advertising value of the airplane in any business is proportionate to its utility and not in proportion to its novelty.

Above anything that may be considered, aside from the service rendered by the *News'* plane, we value the experience it has given us. It has further defined the requirements of the air transport division of the paper and has brought us in closer contact with the aircraft industry. From this we have learned more of the industry's problems and possibilities, and have found its future more promising than ever.

In addition, it has been useful in another way. It has added a note in maintaining the morale of the paper's 1,600 employees. The plane became one of those little symbols of progress all men like to see in the organization to which they devote their labors. This was illustrated when a reporter from another newspaper complained to one of our staff photographers that he was not able ade-

(*Continued on page* 122)



Aerial photos often tell a story words alone cannot convey: Top to bottom, the Goodyear-Zeppelin shed at Akron, a forest fire in Michigan, Lee Memorial on Stone Mountain in Georgia, the city of Detroit from an altitude of 18,000 feet

THE TREND OF THE TIMES

By David Lawrence

The present business readjustment is of world-wide character, as epochal as the economic changes which followed the Napoleonic wars

WITH the elections over and a less partisan spirit in politics prevailing, at least for the time being, the business of the hour is organizing our recovery. As the months roll by, the fact is being borne in all too clearly that the problem is not wholly that of America. The necessity for world-wide reorganization is gradually becoming patent. Thus France and Great Britain are discussing a rearrangement of their credits with each other at the same time that the world is looking askance at a possible upset in Germany which may require further revision of reparations whilst Fascist Italy and communist Russia loom up as possible brethren in an economic partnership.

The cry in the United States is still for a curtailment of production. Factors beyond the control of American producers are affecting world prices. The amazing spectacle of wheat prices in Chicago being above both Liverpool and Winnipeg is only one of a number of phenomena that seem to characterize the strange procession of events which mark out the present readjustment as epochal.

The further we get from the events of 1929 and the expansion that preceded it, the more we recognize that the readjustment is of such major consequence as to be compared, perhaps, with the economic changes which followed the Napoleonic wars. While the world today is geared up to a larger scale of production and deals in a volume much larger than at any time in history, the economic historian points to the middle of the nineteenth century with its record of prosperity relatively greater than that which has been witnessed in the twentieth century. In other words, the per capita gain was greater and the distribution of wealth perhaps more even. It is a curious phase of American psychology which insists upon believing that record heights have been reached only in our own generation. The American people, in the period just before the Civil War, really played a greater part in foreign trade, relatively speaking, than they do today. The clipper ship was on every sea. International trade was then a basis of American prosperity. So it is not unnatural to look forward once more to a re-birth of American foreign trade as a precursor to a stabilized economic structure at home.

We have used the terms inflation and deflation for a decade, and now the word liquidation seems to have come into its own. The puzzling obstacle is labor. Theoretically, it is counted upon to deflate, but it never does. This means the retention of standards of living, for they depend on good wages.

We are drifting into a new era which will, sooner or later, accept involuntarily the idea that the wage levels cannot be seriously disturbed, though to be sure dozens of plans to produce a five-day week are being offered as a means of accomplishing a balance between the new scale of production and the cost of labor. The discussion is all very theoretical still. The important thing is that slowly the leaders of thought are beginning to reconcile themselves to the fact that traditional methods of handling a stock market flurry or a business depression are going by the boards.

For one thing, the effort to produce a better economy at home without consideration of the demands of other peoples abroad, is bound, sooner or later, to be followed by an agitation for a world-wide perspective. Although the United States may, for reasons that appear sound to those charged with responsibility, have felt the need for the stoppage of immigration, as well as the erection of a tariff wall, there is no doubt that both factors have produced some kind of repercussion abroad. It takes time for the rest of the world to adjust itself to American action, all of which tends to retard the recovery.

Heroic measures are being taken by major industries in the United States to keep production down, or at least to prevent its increase. The Sherman anti-trust laws are coming in for much comment because they alone stand in the way of concerted action to reduce production of basic products. The Supreme Court of the United States has decided that the law "cannot be evaded by good motives," which has caused many a business man to shiver, for unquestionably, in the present crisis, a number of steps have been taken which are plainly inconsistent with the Sherman law objectives. The question of whether the Administration which, on the one hand, is trying to restore prosperity and, on the other, is faced with a series of Supreme Court decisions, is going to apply its own "rule of reason" will probably never be answered to anybody's satisfaction. But the fact remains that in emergencies many things are done which are not countenanced when those same emergencies are passed.

The passing observer will do well to note that the very discussion of stabilizing industries is significant. It means that each business and industry is finding it necessary to participate in coöperative processes in order to overcome the ill-effects of ruinous competition or the depressing crises that result from unlimited production.

Certainly, as the end of 1930 approaches, the business men of the country are intensively applying themselves to the job of reorganization. Some of the commodities are responding. Cotton, copper, wheat and steel have been getting most attention. But the "weak situations" in the financial world that have had to be cleaned up from time to time, even though they represent an aftermath of the last three years of speculation, frequently develop for us a psychological reverse. In other words, favorable business developments on the one hand, have not had their full effect on the minds of people generally because coincident therewith have been announcements of bank suspensions which have reflected isolated instances of bad management or bad banking.

Although excellent work has been done by those charitably inclined in the relief of unemployment, the great job of coöperation has yet to be accomplished. The pooling of reserves cannot easily be done in a nation built on individualism, but the basic fact remains that there is plenty of money available to finance the depression. The growth of confidence in the last few weeks has helped, in no inconsiderable degree, in the development of a psychology that the recuperative process is at last under way.

AIRCRAFT INSTRUMENTS AS A SAFETY FACTOR

By Lieut. Logan C. Ramsey, U.S.N.

Instructor, Aerial Navigation
Pensacola Naval Air Station

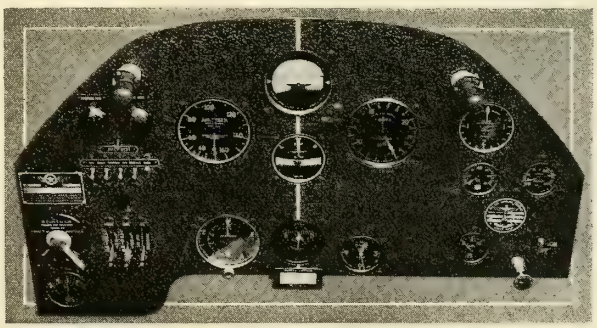
THE average layman considers every aviator more or less of a walking encyclopedia on aeronautics and all of its allied sciences. Usually the pilot is able to give some sort of an answer to any sensible question and sometimes to those not quite so intelligent. Occasionally, however, the poor pilot is stumped as was I when recently asked the following question: "Why is it that the life insurance companies will insure the lives of Army and Navy fliers at a lower rate than they will quote to commercial aviators when you service people are called upon to perform formation flying, aerial gunnery, combat work, catapulting, carrier landings, and other particularly hazardous forms of flight operations that are not a part of the normal functions of the commercial aviator?"

Frankly, I was up against it. All of the more obvious possibilities flashed through my mind only to be dismissed instantly. I could not say that the service fliers were better airmen, for many of those commonly considered as being among the finest fliers in the nation have no active connection with the military flying services. Greater flying experience on the part of service aviators could not be advanced as the reason, for whereas I was unable to name a single service pilot with as many as 4,000 flying hours, I could name half a dozen commercial pilots off hand who are credited with more than that time in the air. I could only venture the tentative opinion that the reason might lie in the fact that the service personnel had the advantage of generally better equipment and more efficient supervision. Yet, even this answer was not completely satisfactory, and I sought an early opportunity to ask the opinion of an official of one of the insurance companies handling these risks.

This gentleman did not care to be quoted but the gist of his answer may be illuminating. Eliminating features which are not pertinent to this discussion or which might open the door to profitless controversy, the main feature of his answer was that, generally speaking, the equipment used by the average commercial pilot was less complete and not as efficient as that provided the service aviator. And when pressed for details he specified instruments and accessories.

The comparative scarcity of aircraft instruments on the panel boards of commercial planes arises from two causes: One may be attributed to present manufacturing practice, while the other must be considered as the direct result of lack of appreciation by the pilots of the true value of instruments. Aircraft manufacturers are naturally endeavoring to produce good planes as cheaply as possible, and one method of keeping down the list price is to keep the number of instruments provided as standard equipment at a minimum. On occasion even these few instruments are not of the best grade or of the most efficient design. Recently I saw a new type of light plane that was provided with three instruments only: a tachometer, an oil pressure gauge and a water temperature gauge. Despite the absence of air speed meter and compass, the salesman spoke glibly of the utility of this plane for the private owner. Flights of two and three hundred miles could be made easily, according to this gentleman. Undoubtedly the plane was capable of flights of this length but the private owner, presumably more or less of a tyro at flying, would undertake cross-country without adequate equipment unless warned by some more experienced flier. Even so the private pilot might assume the attitude that inasmuch as the plane was of a type approved by the Department of Commerce it was presumably adequately equipped for all flights within the range afforded by its fuel capacity. Although it is possible that a few sales might be lost by increasing the initial price of aircraft to include adequate instrumental equipment, I believe that in the long run a greater volume of sales would result if this suggested practice were inaugurated. A single private owner who cracks up or kills himself because of inadequate equipment is a greater sales deterrent than a slightly higher initial cost of the plane.

Aircraft instruments should be considered in the light of additional insurance against aviation accidents. Recently a plane costing about $27,000 was saved by the presence of four instruments on its panel board. The total cost of these instruments was not more than $200. The plane was a well-known type of amphibion and was flying over mountainous terrain on the West Coast. With very little previous warning this plane was caught, while crossing a mountain pass, in thick weather. One of the pilots, after his colleague had permitted the plane to fall into a diving spiral at high speed, was able to right the plane and fly by instruments until a clear weather area was reached. Had it not been for the presence of these instruments upon the panel board, a most disastrous crash would have been inevitable.



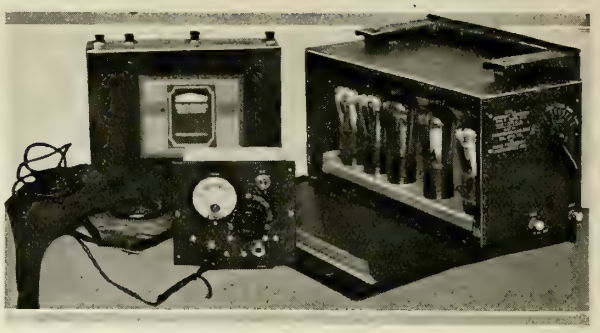
An example of a well-equipped instrument panel is that of the Boeing transport plane model 40-B4

On another recent occasion three small planes with more or less inadequate instrument equipment for a flight of the kind attempted took off from an island to fly across water to another island some distance away. For some reason the course set by these planes was sadly in error and, had it not been for the presence of a large following plane with complete instrument and

(*Continued on page* 148)

RADIO ON THE WORLD'S AIRLINES

Herbert Hooner Jr

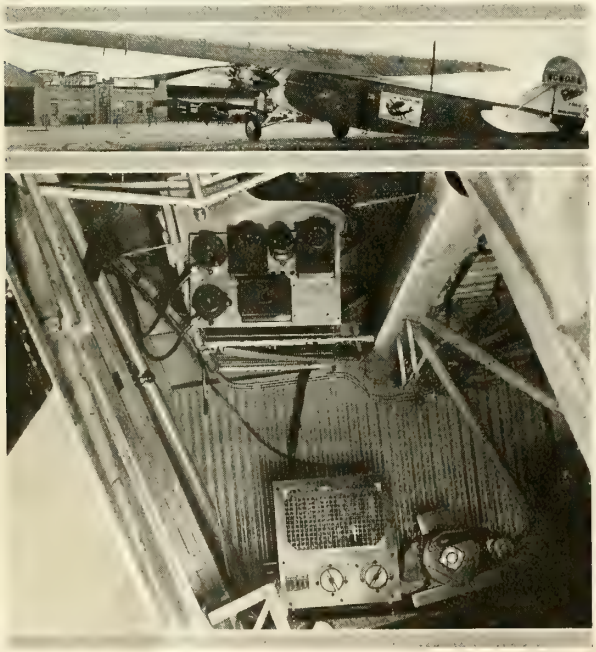


Radio receiving unit used in N. A. T. planes

IN the first part of this article a comparison was drawn between the radio operations on the major airlines of Europe and the developments that have taken place along similar lines in the United States. The American transport systems the radio operations of which were described included TAT-Maddux, Boeing Air Transport and Western Air Express. This month National Air Transport, Pan American Airways, New York, Rio and Buenos Aires Line and the operating subsidiaries of the Aviation Corporation of Delaware will be briefly analyzed.

National Air Transport was probably the first American airline to use radio regularly in its operations. Its use of radio has been restricted, however, to long-wave reception from the Department of Commerce broadcasting stations only. Two-way radio between ground and plane, either on long or short waves, has not been undertaken except experimentally. A program has been announced, however, which when carried out should provide a highly efficient two-way system.

It is understood that ten ground stations are contemplated between New York and Chicago, spaced about 75 miles apart, each one to be of 200 to 400 watts power. The airplanes will be equipped with transmitters of 50 watts power, and will carry both long- and short-wave receivers. Experiments to date have been made using a fixed transmitting antenna running from each wing tip back to the vertical stabilizer, and then forward over the top of the mast to the mail compartment where the apparatus is located. Tests with this arrangement have apparently proved satisfactory, and all the planes will be rigged in a similar manner.



Radio equipment on one of the Fokker F-10 trimotors of Universal lines: The upper view shows the mast and wing antenna; lower view, installation in the fuselage below the pilot's seat

It has been stated that radio telephone will be used exclusively. In this connection it is very interesting to note, now that the plans of the National Air Transport have become known, that every one of the major transport lines operating within the United States has adopted radio telephone instead of radio telegraph for plane-to-ground communications.

It is expected that the relatively close spacing between the ground stations on the N. A. T. route will enable the communications to be made entirely on a single channel in the 3000-kilocycle (100-meter) band. This will obviate the necessity of shifting into the 5600-kilocycle (53-meter) band during daylight hours, which is the general practice of most of the other transport operators at the present time.

Pan American Airways has been one of the pioneers in short-wave two-way communication. To this company, with its long over-water route and isolated airports, radio was a prime necessity from the very beginning. A network of 35 radio telegraph stations has been built up, extending from Miami down through the Carribean and across to Panama. From there it branches north through Mexico to Brownsville, Texas, and south along the west coast of South America.

The ground stations are from 250 to 500 watts power. In many instances, where commercial current was not available, gasoline-driven generators had to be installed to provide the necessary power supply. Because satisfactory commercial radio equipment could not be obtained, the company manufactured all its own apparatus in its shops at Miami.

The airplanes are equipped with a radio telegraph transmitter using two 7.5-watt tubes. By changing coils the operator may transmit either on short waves (5690 kilocycles, 53 meters) for communication with the company's own ground stations, or on 500 kilocycles (600 meters) for marine vessels that may be within range. A trailing wire antenna with weight is used in preference to a fixed arrangement.

The radio system of Pan American Airways uses telegraphy exclusively. The problems presented by long over-water flights which require wide spacing of the ground stations, together with the heavy static that is always experienced in tropical and subtropical climates, could be overcome only by the greater carrying power of telegraph. In addition, it was very desirable that the planes be able to communicate directly with boats on the marine calling frequency of 500 kilocycles (600 meters) in case of trouble while they were over the water. At first the co-pilots or stewards were trained as radio operators, but this proved to

be unsatisfactory and now a commercial radio operator is carried as a regular member of the crew in addition to the pilot, co-pilot and steward.

In addition to communications with its airplanes, Pan American Airways uses radio for point-to-point communication between its airports and operation bases. A majority of the company's operation, traffic and administration correspondence is handled by this method.

An outstanding example of the reliability and great value of aircraft radio occurred during the recent disaster at Haiti. During the hurricane all communication with the island was wiped out, and the first authentic reports of the extent of the disaster were sent by radio to Havana from a Pan American airplane flying over the island the next day.

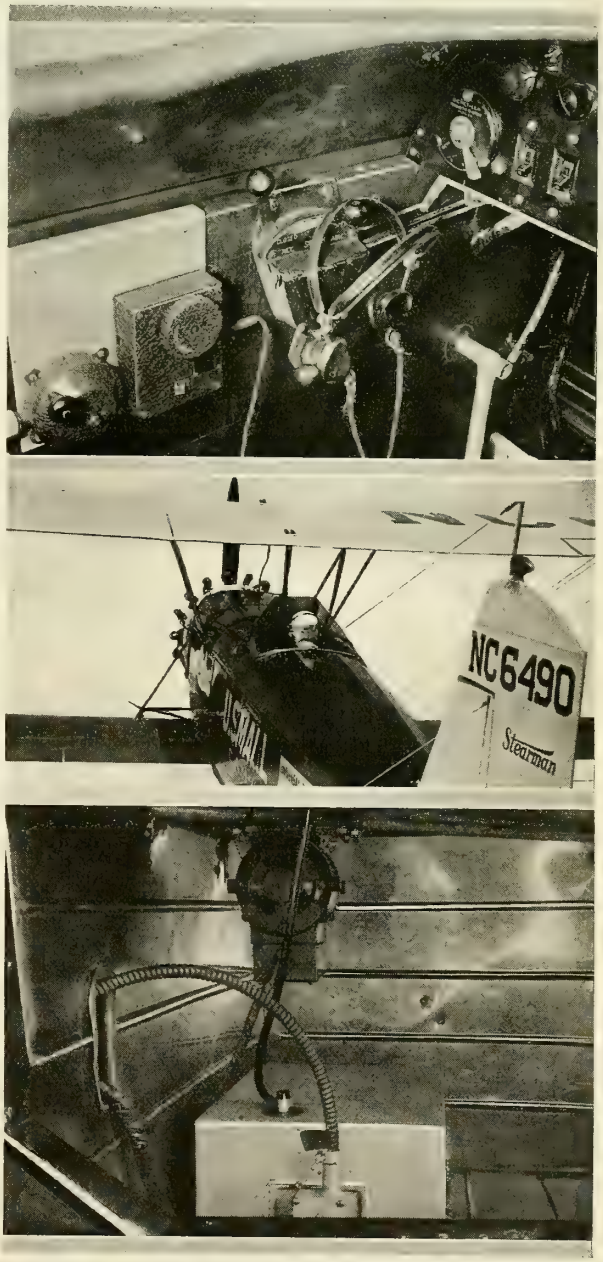
The New York, Rio and Buenos Aires Line, which was recently merged with Pan American Airways, had begun the installation of an extensive radio network. The equipment and methods of operation were essentially of the same character as those used by Pan American. The merger of the two companies was particularly fortunate from a radio point of view, because duplication of facilities and personnel at many airports caused mutual interference, and was economically unsound not only from an operating standpoint, but also because an unnecessarily large number of radio channels were being occupied.

The operating subsidiaries of the Aviation Corporation of Delaware represent the greatest airline mileage under single control in America. For this reason it is particularly interesting to examine the radio policy of this group of companies.

Experimental operation was undertaken late in 1929 on a few of the planes on the Colonial Air Transport between Boston and New York, and on Universal Air Lines in the Chicago territory. The tests, which extended over a period of about a year, included both telephone and telegraph operation and employed practically all types of apparatus which were available. As a result of this work it was decided, in the summer of 1930, to standardize on the telephone type of equipment throughout the system, and the task of installation got under way. At the time this analysis is being prepared, in November 1930, two of the larger divisions have been equipped, and others are in the course of completion. Practically all planes of Colonial Air Transport are now operating with radio, and ground stations have been erected at Newark and Boston. The channels in use on this system are 5600 kilocycles (53 meters) in daylight and 3238 kilocycles (92 meters) at night. In accordance with the requirements of the new air mail contract from Atlanta to Los Angeles, via Dallas and El Paso, the planes of Southern Air Fast Express (formerly Southern Air Transport) have been equipped with radio telephone apparatus, and about fourteen ground stations have been installed along the route. The channels in use on this system are 5630 kilocycles (53 meters) in daylight and 3484 kilocycles (92 meters) at night. The type of equipment, manner of installation, and method of operation are substantially the same as described previously in the case of Western Air Express and Boeing Air Transport.

Southern Air Transport had been using radio for point-to-point communication between its airports and operation bases for a period of about eighteen months, but two-way communication with planes in flight had been undertaken only to a limited extent before the changes noted above took place. The point-to-point system has been continued in addition to the new plane-to-ground system, using 6275 kilocycles (85 meters) in daylyight and 3484 kilocycles (85 meters) at night. The operation of the point-to-point system is the same as that already described in connection with the Western Air Express and Pan American Airways.

Since Part I of this article was prepared, the transcontinental operations of TAT-Maddux and Western Air Express have been combined into a single operating company known as Transcontinental and Western Air, Inc., and the route extended from Columbus into New York. The radio operations of the two original companies have been combined, and to comply with a recent order of the Federal Radio Commission, the Eastern Division from Kansas City to New York is being changed over from long waves to short waves. The point-to-point system of Western Air Express is also being extended to cover the Eastern Division.



Installation of radio in a Stearman mail plane, Continental Division, American Airways: Upper, receiving headset and dials in cockpit; center, mast antenna; lower, installation in fuselage

As a result of the re-alignment of many of the transport companies under the Watres Act, the Federal Radio Commission adopted a new policy, as set forth in general order No. 99, in assigning channels for aviation radio. The Commission has recognized three east and west transcontinental trunk lines, and one north and south trunk line on the Atlantic Seaboard, as the basic arteries of air transportation and communication. Except in a few isolated cases, all of the other air routes may be grouped as feeders to one of these trunk lines. Each one of these units—a trunk line and its feeders—is known as a "CHAIN" and for purposes of identification, a color has been assigned to each one; namely, Blue, Red, Brown and Orange. Each of these chains has been assigned a group of frequencies in such a way as to minimize interference at places where two or more of the chains come together, and yet to allow the maximum amount of coöperation and efficiency among the various stations belonging to the same chain. The actual channels assigned to each of the chains are set forth in the accompanying table.

There are approximately 75 ground stations and 125 airplanes operating with radio telephone on these frequencies. In almost any location in the United States it is possible to tune in on their conversations, and it will give a real thrill to anyone interested in aviation to follow the progress of a plane—perhaps that of a friend—as it moves along the airway. The most practical method of doing this is to purchase a short-wave "converter" (at a cost of about $15) which can be attached to any broadcast receiver. During the daylight hours best results will be had between 5500 and 6000 kilocycles (50 to 55 meters), whereas at night most of the stations will be heard between 3000 and 3200 kilocycles (92 to 100 meters). The reception of planes flying between San Francisco and Los Angeles has been repeatedly reported by listeners on the Atlantic coast. One evening spent in listening to these conversations will provide a most convincing demonstration of the safety of scheduled air transportation.

During the latter part of 1929 it became apparent to most of the larger transport companies that a high degree of coöperation would be necessary between them if the maximum efficiency was to be obtained from their radio systems. It was this desire for closer coöperation that led to the formation of Aeronautical Radio, Incorporated.

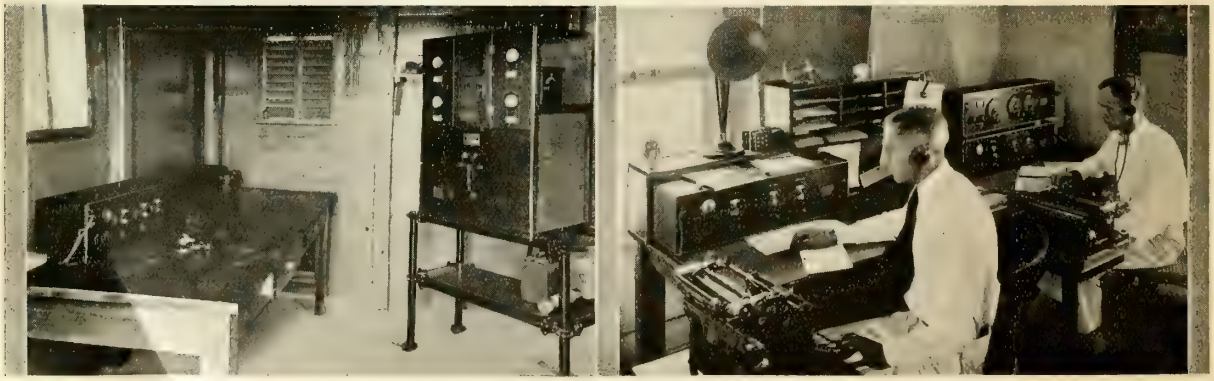
This company was formed as a non-profit organization, the entire stock of which was subscribed to by the transport operators. The amount of stock held by each is proportional to the average number of miles flown daily on their respective systems, although no one transport operator, or group of affiliated operators, is permitted to hold more than 20 per cent of the total. At stated intervals the stock is redistributed in order to conform to changes in the proportionate size of their various operations. Any bona fide transport operator may participate in the company under the same terms and conditions as those which are already members. A recent list of members shows that practically every transport concern in the United States is represented:

American Airways, Inc. (operating subsidiary of the Aviation Corporation of Delaware); Boeing Air Trans-

(*Continued on page* 148)

TABLE 1.—RADIO CHANNELS ASSIGNED TO AVIATION

		DAY		NIGHT	
		Kilocycles	Meters	Kilocycles	Meters
I. RED CHAIN		5,570	(53)	3,160	(95)
Northern Transcontinental	RADIO TELEPHONE	5,660	(53)	3,166	(95)
	(Mobile)	....	....	3,172	(95)
Boeing Air Transport		....	....	3,178	(95)
National Air Transport	RADIO TELEGRAPH	6,215	(48)	2,482	(119)
Pacific Air Transport	(Fixed)	6,230	(48)	2,506	(120)
Varney Air Lines		....	....	4,124	(72)
II. BLUE CHAIN		5,510	(54)	3,070	(98)
Middle Transcontinental	RADIO TELEPHONE	5,540	(54)	3,076	(98)
	(Mobile)	....	....	3,082	(98)
		....	....	3,088	(98)
Transcontinental and Western Air		6,350	(47)	2,722	(110)
Western Air Express	RADIO TELEGRAPH	6,365	(47)	2,734	(110)
West Coast Air Transport	(Fixed)	6,380	(47)	4,108	(72)
Mid-Continent Air Express		8,015	(37)	....	....
		12,180	(24)	....	....
III. BROWN CHAIN		5,600	(53)	3,238	(92)
Southern Transcontinental		5,630	(53)	3,244	(92)
	RADIO TELEPHONE	....	....	3,452	(86)
	(Mobile)	....	....	3,460	(86)
Southern Air Fast Express		....	....	3,468	(86)
Southern Air Transport		....	....	3,484	(85)
Colonial Air Transport	RADIO TELEGRAPH	6,260	(48)	2,326	(130)
Universal Air Lines	(Fixed)	6,275	(48)	2,344	(129)
		12,210	(24)	4,140	(72)
IV. ORANGE CHAIN	RADIO TELEPHONE	5,405	(55)	3,070	(98)
Atlantic Coastal Chain	OR TELEGRAPH	5,690	(53)	3,076	(98)
	(Mobile)	8,650	(34)	....	....
		6,305	(47)	2,662	(113)
Pan American Airways	RADIO TELEGRAPH	6,320	(47)	4,164	(72)
New York, Rio, and B. A. Line	(Fixed)	8,015	(37)	....	....
		12,210	(24)	....	....



Ground stations of the Pan-American Airways System. Left, radio telegraph sending and receiving apparatus at Maracaibo, Venezula, and, right, the radio receiving room at Panair's operating base at Miami, Florida

AIR—HOT AND OTHERWISE

Forget 1930, but—

By Frank A. Tichenor

THE year 1930 ought to be remembered by Our Gang as a turning-post, a pylon, in the great Progress Race of the whole Aircraft Industry. If the lessons of the various adversities it brought to us are heeded, it will be of ultimate benefit.

Those who have survived the past twelve months will not copy the methods which destroyed their brethren or seriously injured them. Those who have been walloped for the count, but who on regaining consciousness are determined to come back, will watch the fighting technique of the coming year with eyes more careful and alert; they will be ready to dodge, duck or, better yet, to counter.

Aviation has literally captured the world within a few short years. It is the fastest means of travel, and its best record was made in the speed with which it traced its splendid lines upon the map of human achievement. It took a world depression even to stay its progress.

It was originally an idea and nothing more. It still is an idea, but now also a great deal more than that.

The measure of the industry's recovery and the distance which, during the new year, it will travel beyond the point which it had reached before Wall Street began to chitter in its now famous epileptic fit will be definitely determined by its own perseverence and intelligence.

One very great essential of a rapid recovery will be team work. Another will be the broom and dustpan. The industry must sweep around in the nooks and corners of its floors for the misfits, the speculators and crooks who may be left. Many have been cleaned out by the cyclone of panic which hit all American business. The rest must go. Those businesses will recover most quickly which accept facts pluckily and then rebuild intelligently in such a manner that at least the old mistakes will be guarded against.

The year 1931 will offer manufacturers of aircraft unlimited opportunities. These possibilities will not, however, send in their cards, presenting themselves in the form of orders to sales managers who spend their time in idle hopes for improved business conditions. A certain rich man of ancient history, finding those he had invited to his feast tardy or neglectful, sent huskies out into the highways and the hedges to compel the attendance of whomsoever they might find. He meant to have his victuals eaten. They were hungrily devoured.

One of the first places where the industry should look for business is the Army Air Corps. A second is the Navy Bureau of Aeronautics.

Trubee Davison in his annual report stated that "although progress has been gratifying, obstacles confronted the completion of the program which only legislation and adequate appropriations could remove. The most important of these obstacles was slow promotion schedules for officers and the failure of the Five-Year Program to make allowance for the large percentage of planes which are constantly undergoing major overhaul."

Team work should be our slogan. I believe that before the present Congress adjourns the problem of promotions will be satisfactorily adjusted under the guidance of that able champion of aviation and chairman of the House Military Affairs Committee, Congressman W. Frank James. The Furlow bill was passed unanimously by the House on two occasions, largely because Congressman James was in command of the forces of righteousness which had the task in hand. He has been intensely useful to American aviation, both as a committeeman and on the floor of the House. Our promotion legislation met its Waterloo in the Military Affairs Committee of the Senate, where we believe the objections were principally the result of failure to understand conditions actually extant in the Army Air Corps.

Hearings this year (1931) should make unmistakably evident the real necessity for immediate relief, though it should be very definitely remembered that we have no W. Frank James in the United States Senate. In the last analysis the failure of the procurement program rests upon the aeronautic industry because it did not properly present the facts to the authorities in Congress.

It may be well to explain that on June 30, 1930, when 1,520 serviceable planes should have been available under the Five-Year Program, 1,309 were REALLY available because 211 of the 1,520 were on order. This reads almost like living up to the program, but study reveals that, besides the 211 on order and not delivered. 133 were unserviceable and 252 obsolete. Thus, in reality, 596 planes called for by the program were not actually in commission, although anyone who wished, in Washington, could make it seem to the public that conditions were very different. Even of the 924 planes apparently available to the Army Air Corps 162 were assigned to National Guard units (which surely needed them), leaving 762; and of these the organized Reserve has 121. And, by the way, 250 of the remainder are overseas in Panama and the Philippines. Today 391 planes are actually available for the defense of the whole United States should an attack be made on us tomorrow morning before lunch, or Thursday afternoon. Not much defense for our vast territory and approximately 10,000 miles of boundary-line, wet and dry!

One of the principal framers of the Five-Year Program tells me that Congress intended it to mean that we should have 1,520 serviceable planes, at all times ready to take to the air, at all times ready to fight. Count 'em—1,520. That's what Congress meant. See the necessity for team work there?

It is the obvious duty of the industry to bring this matter to the front. Each public spirited person interested in American aviation should write to, wire (every now and then) or personally approach his Congressman and his Senator. The law was wise; it was framed and passed by patriotic men. An interpretation of it very different from that which now maintains should be insisted on by Congress. If the original sponsors would supply the industry with their interpretations of the law—and they would be glad to do so, if requested—the whole industry and everyone associated with or interested in it, forthwith should present them to the people of the nation. They it was who demanded the Five-Year Program and whose representatives originally passed it. If the people understand what has been done to it, they will require a readjustment. The people of this nation are already far more deeply interested in our air defense than is realized, and daily they become more interested. They will eagerly accept carefully planned suggestions to learn from their Congressmen why the Five-Year Program has not been lived up to.

Congress, in fact, wished it and demanded it. It still wishes it. But it has many other things to do. Only stimulation by an expressed popular

(*Continued on page* 124)

GET SET FOR 1931

By Don Rose

WHAT may some day be reckoned the longest and most painful year in aeronautical history is ended at last, and only Professor Einstein could say where it has gone or where its successor has come from. But at last it is over, and none of us is nearly so sorry as we should be at parting forever from a friend who stood by us for twelve months and picked our pockets and black-jacked our bank accounts and in other pleasant ways made 1930 a memorable and exciting year. The annual celebration of the New Year has, therefore, more sincerity, optimism, faith, hope and charity to the square inch than many of its predecessors. Having known the worst, we know things are bound to be better, and when we wish each other a Happy New Year we're not fooling.

I wish to say a kind word in defense of the dear departed. For instance, I think it certain that 1930 will be remembered for a long time and that the progress of commercial aviation may some day be reckoned from it, just as some folk still count the years from the time of the big wind in Ireland. I suppose that those who survived the flood of very ancient times felt very much the same way and revised the calendar accordingly. They probably marked time from the date when the dry land came in sight again. That's what aviation will do, when it looks back some day to the anxious year of 1930.

But 1930 has also rendered a positive service to aviation, though it hurt while it was happening. It should be remembered as the year of the big shakedown, the year when everybody took it on the chin and only the tough babies stood up under the punishment. It was a year in which a lot of pipe-dreams blew away and a lot of Humpty-Dumptys fell off the wall. It was a year when the fundamental laws of economics worked the old squeeze play on aviation and forced out a lot of hot air, water and dead wood.

It is noticeable that a number of critics and analysts, most of them bystanders to the big game of aviation, have found this a fine time to be taking our favorite trade across their knees for a good spanking. They found fault with its methods, management and motives, its past, present and future. They have revived again the alarmist arguments of the anonymous "Neon," who let out a wild whoop of alarm about three years ago and hasn't been heard from since. They have said, more or less politely, that aviation has nowhere to go and can't possibly get there. And they have drawn their evidence principally from the facts and figures of 1930, the misfortunate year which has just vanished into history.

But in reckoning the profit and loss of 1930, nobody has a right to consider aviation apart from all that has been going on elsewhere. Two-thirds of its troubles, at a conservative estimate, are not its own; they belong to the big stomachache that is bothering the entire industrial world. The depreciation of aviation stocks, for instance, can be made an occasion for cat-fits and cries of anguish, but it's criminal negligence to consider the matter apart from what has happened to securities of every sort and character. The ratio of unemployment in the industry is a serious matter, but so it is in the cotton yarn business, the toothpick trade and the journalistic profession. The scarcity of cash customers is discouraging, but so it is to the manufacturers of steel, silk and shaving soap and to the salesmen of anchors, andirons, and pickled anchovies. The critics who are taking this opportunity to poke holes in aviation conveniently forget what has happened to every phase of commerce except the apple industry.

The big shake-down wasn't a local affair. It hit nearly everybody and hurt nearly everybody, from bishops to bootleggers and from department stores to peanut stands. And as we take a chance and wish each other a Happy New Year, we hope that 1931 is going to show that this painful process of adjustment was somehow all for the best. Most calamities, personal and public, seem eventually to turn out that way. While they are going on we are disposed to think that the end of the world is an immediate prospect; later we look back at them and discover they were the beginning of better times and healthier conditions.

Already we begin to see that the shake-down was at bottom a wholesome and necessary affair, possibly overdue and certainly inevitable at some time or other. Business in general was suffering from swelled head, acidosis and hardening of the arteries. Production had outrun distribution, specialization had become too rigid for the world's good, and capital and labor were pulling apart again after becoming pretty well acquainted with each other. The fate of the average man is more or less representative of what happened to big business and little business and to the industrial world as a whole. Two years ago he had very commonly forgotten that work and wealth have anything to do with each other; he had forgotten the fundamental difference between industry and trade; he had forgotten even the simple law of supply and demand. So perhaps he stuck his nose into the stock market and got pinched for his pains; or perhaps he pyramided his personal investments in property by way of installment obligations which were really a species of gambling on his own future; or perhaps he chose himself a scale of living which had nothing to do with his real usefulness to society. By now he has learned better.

Business did the same, in this portentous year of 1930. Somebody has just discovered, for instance, that the shoe factories of the United States can manufacture more shoes in a year than the entire nation could wear out if it quit working unanimously and went on a year-'round walking tour. The rayon factories, not only of America but of the whole world, are facing the fact today that they can manufacture at least twice as much rayon fabric as their customers can use. In another industry it has been discovered that ten times as many men were needed to market an article as were needed to make it, so that in this particular trade the salesmen were hopelessly outnumbering the producers. These are only single symptoms, but they show that something needed to happen to bring us all back to realities.

Having just survived another Christmas, I know something of how this sort of thing happens. There is, for instance, the cheerful custom of the Christmas card. It doesn't go back, as you might suppose, to the Middle Ages or even to the good old days when it regularly snowed on Christmas and people drank wassail and ate fat plum puddings to show that their heart was in the right place. The Christmas card isn't any older than I am. And I can remember when a dozen cards would do for my Christmas greetings, and I can also remember that a few years later I needed fifty and eventually two hundred and so on and so forth. The day after Christmas had come to be a day devoted to checking up on the Christmas cards and discovering who had been missed.

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EDITORIALS

A PRACTICAL EXAMPLE OF GOOD MANAGEMENT

APPARENTLY W. B. Mayo and the Ford company's airplane division have not been depressed by current business conditions. They have designed and tested a greatly improved trimotored transport ship and as a result have, even in the throes of hard times, three-quarters of a million dollars' worth of new business so close at hand that they can get it the very minute they decide to accelerate production, a brief process in any Ford enterprise.

Their example provides excellent study of the effectiveness of good management. At the Ford airplane factory 500 men now work full time five days a week, whereas on August 1st—before the announcement of this new transport ship—150 men worked half time. New equipment also is going in as fast as possible to provide for even more intense activity. Our own and other governments, as well as the transport operators, have created a demand for the new ships with their cruising speed of 122 miles per hour and their low fuel consumption. National Air Transport gets seven for its Cleveland-Chicago route; the Army and Navy have contracted for several ships; and the progressive Chilean government has put in an order. Old Ford ships are being converted into the new type for several lines, including ten for Transcontinental and Western Air, Inc. Other airlines which have ordered new ships or the conversion of old ones are Colonial Air Transport, which operates between New York and Boston; Northwest Airways, which flies between Chicago and Twin Cities; and Eastern Air Transport, operator of the New York-Atlanta mail and passenger service.

OVERHEAD CABLES AT AIRPORTS

IN many ways the incomparable Will Rogers is worthy to be ranked as a great sage. As a newspaper columnist and as a stage entertainer he displays a brand of humor which is at once amusing and wise. As a traveling business man, he always flies, for he has found air travel enjoyable and advantageous. And, incidentally, his frequent use of the airplane has made him more familiar than most laymen with the characteristics of our airports. Especially has he noted that landing fields are too often rendered hazardous by electric wires. Will expressed his estimate of this condition with characteristic good humor: "An American airport is an area of land at the intersection of two high-tension power lines."

The Department of Commerce, whether or not stimulated by Will's comment, recently asked the states to demand of their utility companies the abatement of this perilous condition, which long has been the subject of complaint by aviation interests. This request would have been made long ago if the protests ever had been registered by organized groups, but such was never the case. How often have the air interests lost through just such neglect! That's one reason AERO DIGEST has been so earnest in its efforts to wake up the N. A. A. Such services as this would be the duty and high privilege of an intelligent N. A. A.

F. C. Hingsburg, chief engineer of the Airways Division, Department of Commerce, who asks state regulatory commissions to require public utility companies to install conduits underground along the boundaries of airports, finds that previous attempts to have power lines removed or buried have brought only statements that the present construction has been authorized by the states and that, therefore, removal would have to be undertaken at public expense.

Mr. Hingsburg does not agree with this. These landing fields are essential to air mail operation. Their usefulness and safety should not be jeopardized by private corporations which have been granted public privileges. It is because of such destructive procedure that corporations lose their popularity and eventually their dividend-making capacity.

THE FUNCTION OF ADVERTISING

SUCCESS is largely a matter of advertising. Calvin Coolidge, after some experience in that line, has accurately appraised the function of advertising:

"It is essential to make good merchandise. But that is not enough. It is just as essential to create a demand for it. That is advertising."

No art, no business, no industry, not even any religion, ever has progressed without advertising. Aviation needs it quite as much as does any brand of breakfast food.

INDUSTRY ASKS STRICTER REGULATION OF ITSELF

THERE is evidence of a high degree of intelligence in the request by aircraft manufacturers that the Department of Commerce institute more exacting performance and structural requirements. Is there another industry which has gone to Washington to seek stricter regulation in the interests of public safety?

Most planes now manufactured more than meet the Government requirements, but the foremost figures in the industry feel that ALL ships on the market should meet not only present requirements, but much more drastic ones. In that way, it is felt, lies such progress as will give to American aviation that complete public confidence which it so much requires. It is an anamoly that while most companies are building planes far in excess of Government safety requirements, a minority of unprogressive manufacturers are producing a few planes which barely can pass muster and yet are licensed under the same law. The leading manufacturers believe that more rigid requirements not only will stimulate business in America, but will add lustre to the already lustrous reputation of American planes abroad.

Therefore for perhaps the first time in industrial history the leaders of American aircraft manufacture are considering an effort to induce authorities to increase performance and structural requirements.

This move will serve another purpose; it will tend to reduce accidents among young pilots of limited experience. Entrusted with planes of minimum performance, such fliers are likely to be confronted with emergencies hazardous to meet. Yet planes are being manufactured in which the same young pilots would never be endangered in any ordinary circumstances.

Raising the standards of performance will eliminate many undesirable things. Planes which narrowly "get by" the official demands, machines which only reach standard and do not go beyond, never will add distinction or much profit to aviation. These manufacturers are right in asking the Government to raise its safety requirements.

"GANGWAY FOR MOSES!"

By

by Caldwell

YOU know, one of the most cheering aspects of aviation is the fact that no matter in what depressing conditions it may find itself, some Moses always arrives and leads it out of bondage and into a land flowing with milk and honey—or gin and ginger ale.

By the way, you six readers know who Moses was, don't you? Just in case any of you have fallen behind in your perusal of the Scriptures, perhaps I'd better draw on my store of biblical learning to inform you that the infant Moses first came to the attention of the Egyptian registry of births when Pharaoh's daughter dropped in and laughingly declared that she had found him in the bullrushes. That story got Moses off to a good start as an infant prodigy, and as he later became a prominent politician there really may be something to the bullrush story, after all. Anyhow, Moses was the one who led the children of Israel out of Egypt and into the Bronx.

And as I say, every now and then some new Moses appears and leads the children of aviation somewhere—usually astray. You just look back over aviation history and you'll see what I mean.

Moses led the Children of Israel out of Egypt and into the Bronx. Every now and then some new Moses leads the children of Aviation out of the mire. Prophet Caldwell predicts the coming of still another Moses to conduct us out of the present desert to a new oasis.

In the first place, the boys started off with gas bags filled with gas or hot air. (These passed away and were reincarnated as the Public Relations Counsel of our day.) During their time, the boys had a lot of fun with the old balloons. They used to go up at country fairs and come down wherever the wind blew them; in fact, no fair was considered first class without a balloon ascension scheduled for five o'clock.

However, interest waned because the balloonist always came down miles away, where the yokels couldn't see him. It began to look as if early aviation was going to die a natural death due to starvation—starvation is still a natural death in aviation—when along came the first authentic Moses of this flying game, the bird who invented the parachute. The balloonatics were saved and led into the promised land of further contracts for ascensions at fairs, for—lo and behold!—they could now soar aloft, cut loose from the balloon, and land right on top of the hot dog stand at the fair grounds.

Interest in aviation slowly waned again. The boys landed on the hot dog stand, the peanut stand, even on the head of the bearded lady—but the visitors, fed up with too much of this sort of thing, turned dispiritedly away and fed the monkeys or threw baseballs at the African dodger. It looked like aviation—what there was of it—was about ready to be folded up and laid away in the Smithsonian with Frank Hawks' glider, when along came the second Moses, the lad with several funny complexes, one of which was the early glider.

This Moses didn't get hardly anywhere, or lead aviation anywhere, at least anywhere near a steady and reliable eating stance, or position. Nobody would pay any money to see a person go aloft in a glider when they could visit the zoo for nothing, so it began to look as though that particular Moses could go back to the bullrushes, when all of a sudden two new prophets appeared in the persons of the Brothers Wright—and aviation was saved again and led into a brand new promised land.

The promised land, however, turned out to consist of about ninety per cent promise and only ten per cent land. True, the boys now had power in their glider—but they were still living on contracts at the county fair. They were right back where they'd started from in the early Victorian age—the closing act in a country show consisting of prize cattle, peanuts, horse races, pop-corn, and "Zo-mah, gentlemen! Zo-mah! Half snake and half woman! Captured in the low-lands of Madagascar by a party of British explorers! She was leaping from tree to tree and eating bark!" And so was aviation, for interest was waning again, and aviation along with it, when—

"Toot-a-toot! Toot-a-toot-toot! Rub-a-dub-dub! Bang-bang!" And along came Moses number four, in the person of the late Holy War for Democracy and Universal Imbecility, complete with dollar-a-year men, Liberty Loan drivers, the Creel Press Bureau, Y. M. C. A. secretaries out to save the troops' souls and the medical dispensaries out to save the rest of them. In the general carnival of saving that ensued aviation not only got saved. It got nourished. It was tucked in the hospital bed of prosperous production, grew fat, healthy, obstreperous, and full of hell.

There was no doubt in anyone's mind that Moses number four had turned the trick and really led aviation into a promised land flowing with death and destruction. It was a War Baby. It still is a War Baby, rapidly growing up. It's going to be Uncle's Big Boy in the next war.

Aprez la guerre, however—I just throw that in to hint that I know French, even if I can't spell it—interest waned again. There was some question as to just what we people had in this aviation thing—was it a war weapon or was it commercial? Anyhow, it didn't matter much. The next war was far off, in any case. Meanwhile, if it was commercial, let it prove the fact. Which it almost immediately started to do—proving that it was hardly commercial for any pilot who enjoyed eating. Anyone embarking in aviation shortly after the war had to bring his own lunch. Plainly, another Moses was due.

And of course he arrived! Did you begin to worry? Tut, tut! Never worry in aviation! Another Moses will turn up, never fear. Along came good old Moses number five, bless his dear old white whiskers and his benign air. And who did he turn out to be but our old friend of the Parcel Post, the Mail-it-early Movement, and the Rural Free Delivery—old United States Post Office himself.

And did aviation strut when it got adopted by this wealthy old gentleman with the mien of a prophet? I

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HALF of AIR ACCIDENTS AVOIDABLE?

By Ernest Jones

THE hope of secure flight has existed from earliest record of mankind. It is but logical to believe, therefore, that there must be a great market awaiting the airplane of reasonable safety in the hands of the average purchaser.

The public, however, is clearly not taking to the airplane as expected, and we are complaining of overproduction. It may be concluded that the public's apathy is the result, in no small degree, of the feeling that the airplane, as we know it, is subject to mysterious and unexplained mishaps.

Much too many of the civil airplane accidents of official record occur through failure of the machine to function properly. What share of these may be considered directly avoidable through immediate improvement in design?

A "material improvement in safety" must be effected if the airplane is to be made a popular vehicle of private transportation, says the current annual report of the National Advisory Committee for Aeronautics.

Spins were responsible for 23½ per cent, or 955, of the 4,020 civil accidents of record in the last three and a half years, according to the information available.

Forced landings are indicated as responsible for nearly 22 per cent or 877 more. In addition, there are constantly occurring many more such landings of which no record is made because no accident resulted.

Spinning characteristics can be designed out of the airplane, which would greatly reduce accidents from this cause. Airplanes have been built in the past—and can be built again—of such security in their flying characteristics that, when used by even the general public, the present high percentage of accidents now chargeable to the vehicle will be largely reduced.

It is admitted among engineers that there can be built airplanes which will not spin—airplanes extremely stable, which will automatically return to the normal position of horizontal flight, with or without power on, from any attitude into which they might fall or be put through faulty pilotage—provided, of course, there was sufficient altitude to permit full recovery. The non-spinning, inherently stable craft not only gets itself out of difficulties, but makes it difficult for the pilot to get into trouble.

True, such a plane would lose some of its present features of sensitive controllability or fundamental design characteristics which permit the pilot easily and quickly to change the direction of the plane's motion: up, down, sidewise or in a bank—acrobatics—but something must be sacrificed for safety. All airplane design is a matter of compromise. If speed is required, we must sacrifice payload, and vice versa. If fast climb is paramount, the additional weight that goes with additional power must be expected, and so on.

But, this extreme attribute of extraordinary controllability—or ease of acrobatics—is unnecessary in the civil plane and, quite likely, will not be demanded by the average purchaser. What average private owner, it might be asked, using his airplane in straight flying, in the course of business or week-end pleasure with his family and friends, needs or expects to loop and roll? Yet, we continue to attempt the sale of professional airplanes to a non-professional public, with continued little success. Here and there, of course, young men or older ones with young ideas, will want to perform for their admiring friends, but there will ever be vehicles especially built for such use, with the safety feature diminished accordingly.

The transport plane, with its cargo of passengers or freight, needs little of this hyper-maneuverability, or "stuntability" as it might be called. There is little argument for the performing airplane in either commercial or private flying.

The public, unfamiliar as yet with all the limitations and possibilities of airplanes, does not know exactly what it wants, nor does it even know what is good for it. The responsibility is upon the manufacturers to protect the public—not upon the shoulders of expert pilots. Government requirements do not demand the non-spinning airplane; in fact, no test is required of the light plane to determine whether or not it has dangerous spinning characteristics.

In view of the fact that airplanes are still largely in the hands of professionals, the high percentage of accidents indicates that even the experienced pilot might well be protected.

Many of the small training and sport planes now in general use may well be said to be actually undesirable and unsatisfactory from a safety standpoint. They have been produced by the demands of those comparatively few who have passed through the first stage of flying and feel the urge for planes requiring more highly developed piloting technique—planes of extreme controllability, capable of easily performing acrobatics, planes of a high degree of maneuverability.

Continually we have been building planes with ever greater controllability and maneuverability, with spinning characteristics retained, and with a constantly increasing percentage of payload to gross weight. We have been building less with the idea of safety than with the idea of performance. The trend has not been toward the building of public confidence.

Powerplant failures are responsible for approximately 15 per cent of the civil accidents alone in the United States, according to the official statistics. It is suspected that the actual figure is much higher. The Air Corps found that 48.5 per cent of all its forced landings in 1929 were due to engine failures, and we may, therefore, add half of the forced landings to the other classification of "engine failures" alone. The Air Corps found that 16.45 per cent of all accidents were due to engine failures. For all its flying, military, naval and civil, France finds the figure to be 35 per cent.

Accidents chargeable to powerplant failure are primarily caused by the tendency to reduce weight, it has been said. It is not absolutely necessary that weight be cut to the last possible ounce, even if safety of the pilot and his passengers were not the principal reason. The airplane, generally speaking, would be perfectly sound economic vehicle had it even less than the present payload. The greatest market—the general public—will not be displeased if safety be substituted for an extra passenger.

Unlike other means of transportation, air travel is predicated upon the possibility of emergency stops—at present. Even with strings of lights and radio beacons stretched along the commercial routes, emergency fields are provided. If the general public is to purchase airplanes

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USING THE AIRPLANE FOR BUSINESS PURPOSES

By Dudley M. Steele

Manager, Department of Aviation
Richfield Oil Company of California

THE use of an airplane in the furtherance of business relations has been discussed innumerable times. But the discussions have more often been theoretical than empirical. The following notes are taken from my own experience in actually using airplanes for strictly business purposes.

The territory over which we operate includes practically the entire United States, and the necessity of making hurried trips to Seattle, Kansas City or other cities is apt to occur at any time. Because of the great distances to be traveled the use of an airplane was decided upon as the only practical means of getting from point to point and maintaining a rigid itinerary.



The author takes advantage of modern equipment and has the Richfield Stearman serviced at an underground pit

With the inauguration of the Richfield Oil Company's department of aviation, in 1927, this decision was reached and the purchase of an airplane authorized. The first plane purchased was an OX-5-powered biplane. This plane was flown for approximately 1,000 hours, including a round trip to New York City, and numerous other long cross-country hops.

In the use of this first ship the necessity of travel by this method was clearly demonstrated. Later it became desirable to use a larger plane with a greater load carrying capacity. To fill this need, a 220-horsepower, three-place open biplane was purchased. After acquisition of the new plane, the smaller ship was used for local contacts and the larger ship for cross-country or long-distance work.

It has always been our policy not to carry pay passengers or passengers on joy-riding trips, the use of the ships having been limited exclusively to company officials on company business, particularly in conjunction with the efforts of the department of aviation.

For a considerable time, the two ships were ample for our needs. As business increased, however, we found it necessary to purchase a third ship—this time a later type, with the same seating capacity though with larger baggage compartments, larger engine, and over-all a larger plane. To date these three ships have been flown more than 250,000 miles without a single accident and without injury to any one.

During this time we were compelled to make only one forced landing (and that only recently) aside from those attributable to weather and generally poor flying conditions. Landings or delayed departures resulting from weather conditions are not classified as forced landings, and whenever conditions are such in the pilot's opinion that flying is not advisable, he has been instructed to land or delay taking off until such time as they are suitable.

When our operations first began, there were very few good airports. Most of the fields were deep with dust or, after rains, veritable seas of mud which practically prohibited their use with any degree of safety. In short, practically every phase in connection with the operation of an airplane has improved to the point permitting one to use the phrase, "modern equipment and facilities." Instead of using five-gallon gas cans and rusty funnels, ships are now serviced at underground service pits or by tank trucks with electric pumps; hangars now have concrete floors and are of steel construction in many instances; airports now include oiled surface runways which permit their use under any and all weather conditions; first-class machine shops handle repairs both to plane and engines, as well as other items almost too numerous to mention.



At dusk 37 Richfield beacons are switched on to light the West Coast air route from the Canadian border to California

Another invaluable and indispensable service is the weather reporting service which was started by the Government and guided through its original state to the point that other departments and organizations have installed a similar service to compile and dispense detailed and usable weather information.

In former days to take a trip of any length without a mechanic was foolhardy and merely inviting an unlimited amount of trouble, for at the majority of airports along any route there were few places where one could obtain competent mechanical service. During the first year of our operation, our expenses were greatly increased as a result of this fact, because it was absolutely necessary to be accompanied by a mechanic to maintain the ship, keep it serviced and in operation. These conditions no longer exist, for Government-licensed mechanics and repair men are to be found on all airports of any consequence, and in many instances on the major airports agents from the principal aircraft engine and

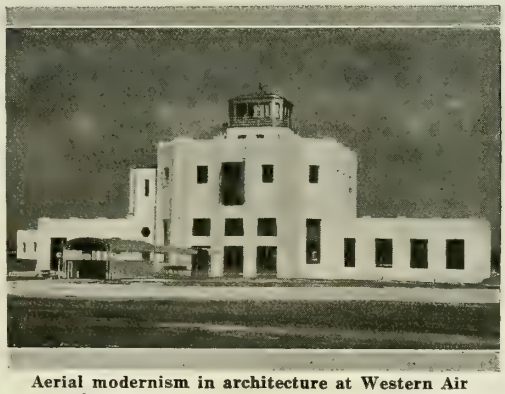




Expressing the solidity of air transport: (left) hangar line at Los Angeles Airport and (right) terminal building at United Airport

airplane manufacturers stand ready to serve.

At this writing, the pilot business man has at his disposal the very best of air navigation maps, information on airports along his route and at his destination, and in general there are ample facilities for every need of the flying executive. The service one receives at regularly operated and maintained airports is on a par with that received by the motorist in driving into one of the present day service stations along a highway.

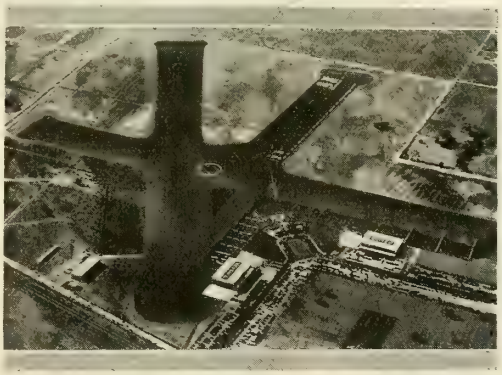


Aerial modernism in architecture at Western Air Express Airport, Alhambra, California

It would be impossible in this article to tell completely the remarkable, dependable and modern facilities which are to be found on airports throughout the United States, for the service of both aircraft and engines.

It has been my pleasure to do a great deal of traveling by plane in the last two and one-half years, not having used a train in that length of time. In a number of cases, it has been necessary to fly after dark. The majority of airports, however, are so well lighted that one of the former hazards of night flying has been eliminated. Night flying with any prospect of landing by depending solely on landing lights on the airplane would have been extremely hazardous and would have been next to impossible with any degree of safety. Today, thanks to the development of airport lighting, it is not only practical but accepted practice.

A most interesting example of the nonchalance with which the public, and particularly the coming generation, is accepting air transportation was evidenced to me recently at one of the airports in the neighborhood of Los Angeles during its normal operations.



The aerial camera looks down at the geometric pattern which is United Airport, Burbank, Calif.

It was quite dark, and we were standing on the airport awaiting the arrival of one of the transports from the south. We heard the hum of its engines and saw the field lights blink. Then we saw the landing light on the airplane (approximately 2,000 feet above us) come on and go off; next the landing light blinked twice indicating a clear port; the ship circled, blinked its light once more; the landing light came on and the ship landed, taxied up and discharged its passengers. In the meantime, while all of this was happening, a gong sounded in one of the hangars as a signal and a tractor came out. As soon as all of the passengers had left the ship, the tractor pulled the big plane to the fueling pit where it was serviced and put into the hangar in readiness for its next trip.

This work had no more than been finished when a mail plane was ready to take off from this field for a destination 600 miles away. It roared away into the night. Soon after it had vanished in the darkness, the operation of receiving another plane, this time from the north, was repeated with the same nonchalance. No one was excited; no one was more than normally interested, perhaps not any more so than we should be at seeing a train pulling into the depot. The ease with which it was all handled shows that air transportation has been accepted. The passengers who disembarked from the ship, did so without any greater degree of nervousness than they would have shown had they been disembarking from a train at the end of a journey.

Our experience in the last two and one-half years in using our

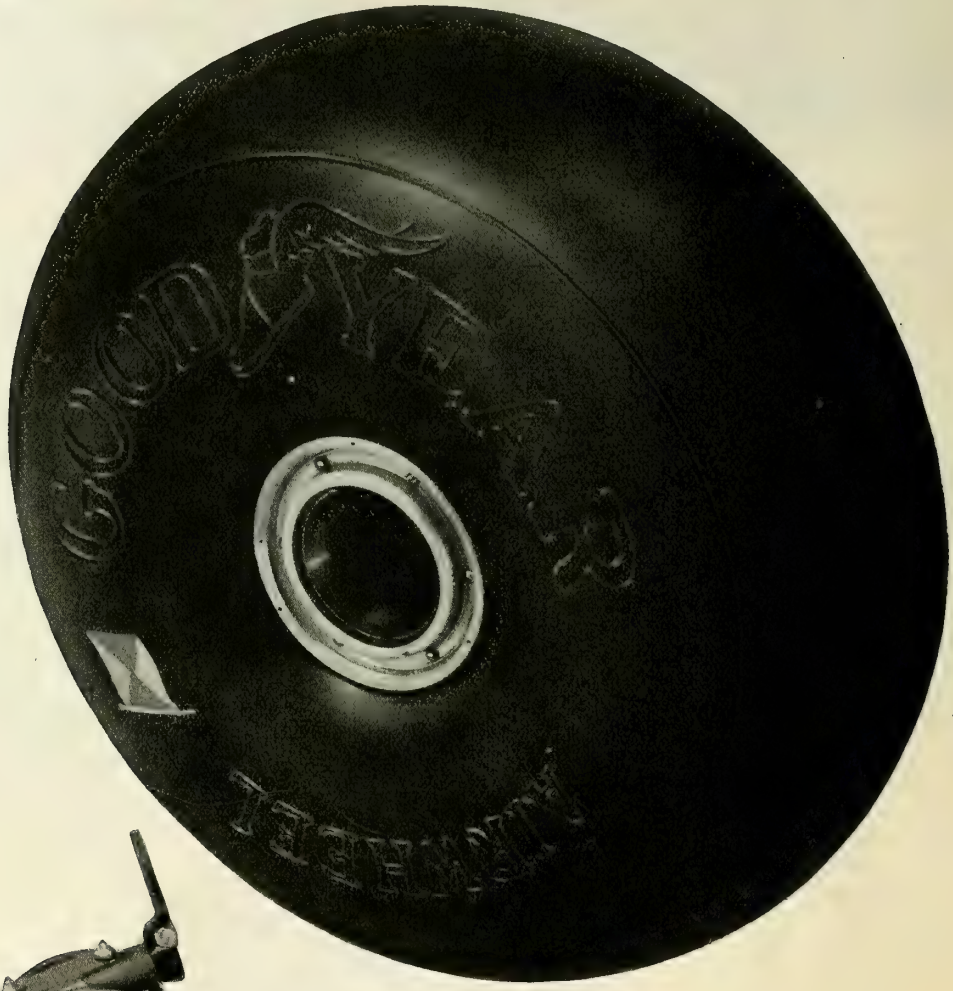
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Façades of dignity on airport buildings: administration buildings (left) at Grand Central, Glendale, Calif., and Fairfax, Kansas City

NOW GOODYEAR





Here they are side by side—the two great Goodyear developments which divorce the airplane tire, wheel and brake completely from automobile limitations

GOOD

gives flying a BRAKE

THE BIGGEST NEWS SINCE AIRWHEELS

Here is a brake that gives Airplanes the same vast improvement in deceleration which four-wheel brakes gave to automobiles.

But this newest Goodyear contribution to safe landing is not borrowed from the automobile — it is new in design, different in principle, designed exclusively for airplane use.

Power combined with *smoothness* and *certain release* are the three great essentials of airplane braking. A brake that locks on the road can do little harm to a car—a brake that locks *once* in landing an airplane can put the ship on its nose.

It's easy to say power and smoothness — it's mighty hard to get them in combination.

But you get them both in this newest Goodyear brake.

You get *power* to hold the plane at a standstill with full throttle — power so sure that you can let the plane roll at full throttle and stop it again.

You get *smoothness* so even, so certain that you can either slide the wheels or bring up the tail, depending on the surface on which the landing is made, and still retain complete control. Of an airplane brake no more can be asked.

You get *power* plus *smoothness* in this Goodyear brake because it is a special internal expanding type — inside the Airwheel hub where it causes no wind resistance — equipped with Timken thrust roller bearings—operated with sure-action toggles that release the instant the braking pressure is released.

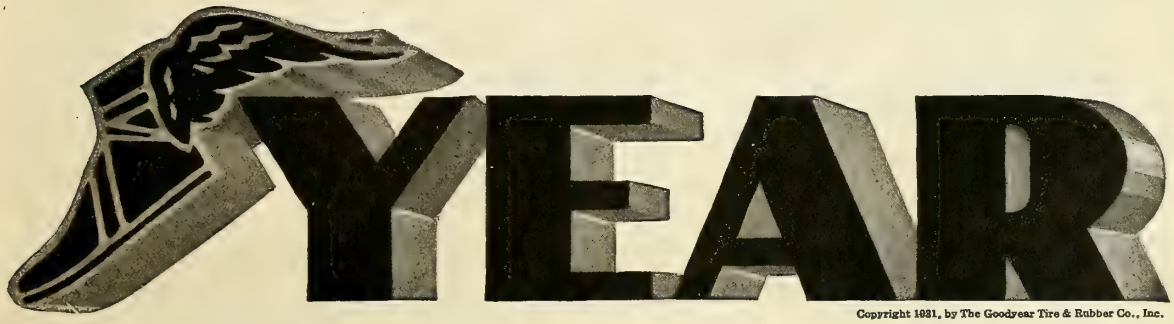
You know what this brake means to pilots — better control in taxiing — full motor speed before starting a take-off — new safety in landing on small fields and in tight places.

Like every Goodyear development, this new brake has been carefully engineered — patiently developed — thoroughly tested before announcement.

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A NEW VERTICAL WIND TUNNEL

By

Dimitry E. Olshevsky

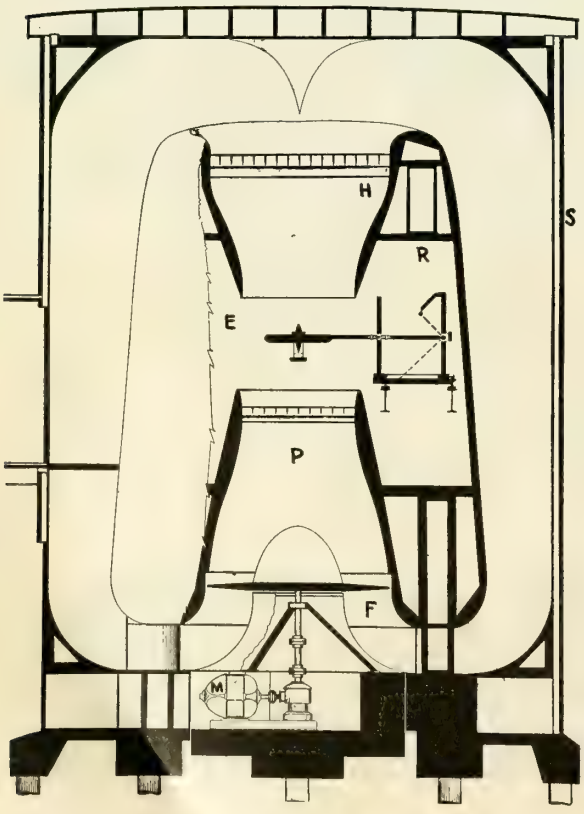
Honorary Fellow,
Sloan Physics Laboratory
Yale University



The Sikorsky tunnel building is only 24 feet in diameter and 32 feet high

THE idea of a vertical wind tunnel occurred to the writer in the fall of 1927 while studying the possibilities of experimental investigation of spins. It seemed, offhand, that a free or properly suspended model in a vertical airstream would represent a closer approximation to actual conditions as they occur in spins. A more detailed study confirmed this assumption and revealed that, besides the advantages in the investigation of spins, a vertical wind tunnel would offer still more valuable advantages over the conventional horizontal type for ordinary aerodynamical research.

During the period 1927-1929 several institutions were approached by the writer with offers of vertical wind tunnel construction, but without result. Finally, in April, 1929, the Sikorsky Aviation Corporation decided to build a vertical wind tunnel at its Bridgeport plant. The writer feels indebted to the corporation, and particularly to Mr. Igor Sikorsky for his keen foresight and correct appraisal of the merits of an unusual design.



Cross-section drawing of the Sikorsky vertical wind tunnel

The vertical arrangement of the airstream results in an experimental section easily accessible and observable through 260 degrees. Moreover, since direction of wind velocity and force of gravity coincide, any position around the airstream is perfectly identical from the standpoint of measuring balances. A peculiar feel of comfort results from the fact that an observer can go around the airstream, remaining on the same floor level and in the same position with regard to observation. It is clear that purely aerodynamical advantages resulting from vertical arrangement are of only a secondary nature.

There is, however, an important saving in space and building costs with a properly designed vertical wind tunnel. Construction of balances represents, of course, a new problem, but no particular difficulties were encountered with the Sikorsky tunnel. A symmetrical arrangement of the air return passages as outlined below, together with vertical arrangement, brings further advantages resulting from geometrical *and* dynamical symmetry of the *whole* arrangement with respect to its axis. This results in a uniform air flow and low overall resistance of the tunnel.

Design and Construction of the Tunnel

The Sikorsky wind tunnel, as shown in the accompanying cross-section drawing, consists of an inner body of rotation (R) housed within a coaxial vertical cylindrical shell (S). This inner body of rotation has an axial air passage (P) going through the experimental chamber. A fan (F) situated at the bottom of the passage draws the air down from the experimental section and then forces it radially and up through the annular space formed between the walls of the outer shell and those of the inner body of rotation. The air returns through the axial intake into the experimental section. The flow thus approximates that of a vortex ring.

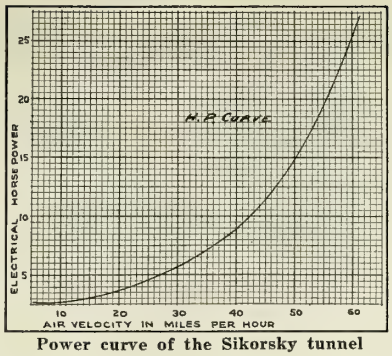
The foundation consists of an inner concrete block supporting the motor (M) and fan, and an outer block supporting the walls and inner structure. Both are separated by a shock absorbing layer for prevention of vibration transfer.

The outer shell is a bolted and welded steel cylinder with air space, planking and plastering on the outside, and air

space plus masonite lining on the inside.

The roof has an insulating air space and is covered by a layer of white gravel. The building is twenty-four feet in diameter and thirty-two feet high. It has a covered passage to the Engineering Department.

The structural problem presented by the rather complicated inner body was solved by the use of ring members and streamline ribs covered with masonite. The inner body rests on streamlined members that serve also as a radial honeycomb.



Power curve of the Sikorsky tunnel

The outer shell was erected first. The upper portion of the inner body of rotation was completed in the shop, disassembled, moved into the cylindrical shell, joined and hinged to the ceiling. Assembly of the lower part was begun, and both parts finally joined within the outer shell.

The wind tunnel proper has a five-foot diameter, five-foot length and free stream experimental section. The airstream issues centrally from the ceiling of the circular experimental room, the latter being fifteen feet in diameter. A De Bothezat fan is driven by a speed reducer and a wide-range twenty-horsepower Westinghouse DC motor. The current is supplied by a special motor-generator housed outside the wind tunnel building. Control of the motor-generator, motor and lights is centralized at a switchboard in the experimental room. The room has a supply of various currents, compressed air, water and a sprinkler system. Steam heating coils are housed within large-area metal streamliners at the bottom of the outer shell. The motor is situated underground and has a special pit permitting inspection and servicing of speed reducer and bearings during operation.

Several special features were incorporated in the tunnel design. The air leaving the impeller passes radially through a set of symmetrical streamliners. The purpose of this radial honeycomb is to diminish the rotational component of wind velocity, and to house the supporting members. Besides this large radial honeycomb, there is another one (H) on top of the entrance cone consisting of two independent layers of symmetrically streamlined blades. Each blade is adjustable to a specified angle. Slots for the suction of turbulent layers are provided in the exhaust cone.

An extensive test period was necessary in order to attain good performance of the tunnel. It comprised changes in intake and exhaust cones, determination of proper size of slots for the suction of turbulent layer, adjustments in honeycombs, changes in the impeller, proper finish of air passages and so on. The lower part of the intake cone was modified to a slightly tapered conical shape. The entrance of the exhaust cone was properly streamlined. The original size of the slots for the suction of turbulent layers was cut in half, and honeycomb blades were adjusted for a precise distribution of angles (the blade chords are not exactly parallel to the axis of the tunnel). Changes in the impeller blade setting were made by adjusting them to calculated angles. The masonite lining was surfaced, varnished and painted. Each of these operations resulted in a considerable increase of air speed in the experimental section. The total gain, including the effect of streamlining and finish, represented a twenty-four per cent raise of speed, suppression of pulsations and uniform speed distribution.

With a power input of twenty-five horsepower at the motor shaft of the speed reducer, a maximum speed of sixty-two miles per hour has been recorded in the central region of the experimental section.

The power coefficient, K, of the wind tunnel corresponding to the formula:

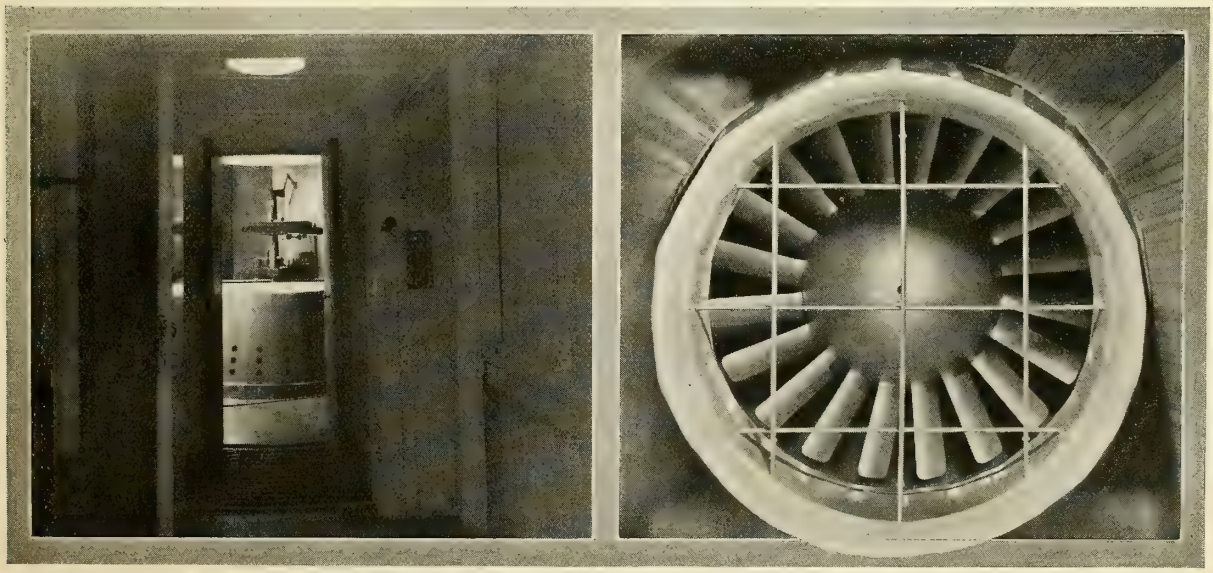
$$P = KV^3 A\ 10^{-6}$$

where

P is the input power in horsepower,
V is the throat velocity in feet per second,
A is the area of the experimental section in square feet,

is then $K = 1.70$, a very efficient value indeed.

The speed distribution has been found to be remarkably constant over the greater portion of the experimental section, variations being of the order of $\pm$ ½ per cent.


The vertical wind tunnel design is unusual: (left) the experimental chamber as seen from the covered passage to the Engineering Department, and (right) looking down at the impeller fan

THE CREATION OF LIFT BY A WING SECTION

Dr. Max M. Munk's Seventh Article on the Principles of Aerodynamics

WING section flow by itself, and separate from lateral wing air flow, must be regarded as the diverting of air in a downward direction. The wing section is an air deflector. It has the effect of deflecting and throwing down the air passing by it. An upward velocity component of the arriving air is converted into a downward component by the wing section, and lift is created by the reaction to this change of motion.

In this process of deflection each air particle comprising the flow takes part in a different degree. The deflection of those air particles passing some distance from the wing section is much less pronounced than that of those close to it. For the investigation of the resultant effect, however, it is much more convenient to assume that the proximate air creates all lift and that as it does so all particles are uniformly deflected. Actually, too, that condition is not so far from the truth, for the near-by air particles create most of the lift and the deflection rapidly disappears in the air at a distance from the wing section. The angle of this uniform air deflection is equal to the angle between the direction of motion and the direction of the wing section, or rather the mean direction of the wing section.

All portions of the wing section have directions of their own in which they tend to guide the air. The guiding action of the entire section is equivalent to an average guiding direction of the section. The angle of the assumed uniform air deflection must be considered as the attack angle of the wing section's average direction.

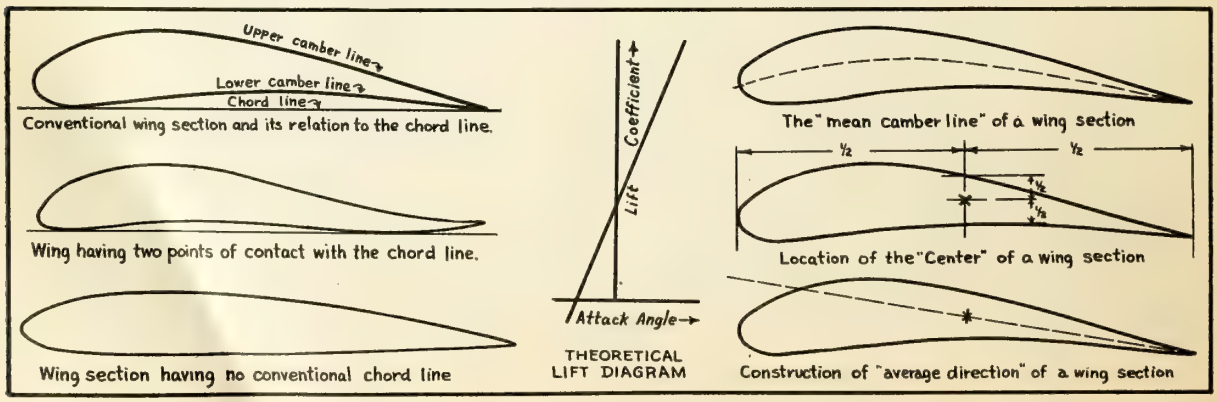
This leads us to angles of attack, of which there are many varieties. The common or ordinary angle of attack is denoted by α. This is the angle between the direction of motion and the wing chord. For most sections the wing chord is defined as the bottom tangent through the trailing edge or as the line of a straight edge brought into contact with the lower surface of the section at two points. When no such tangents exist, a special definition is necessary in each case.

From this common angle of attack are derived those known as absolute angle of attack, effective angle of attack, and finally, absolute effective angle of attack. The absolute angle of attack, denoted by α_a is measured from the average direction of the wing section. It is therefore zero when the lift is zero, which circumstance makes it unusually satisfactory for computations. The absolute angle of attack is, unfortunately, not practical for design work, because the draftsman cannot take it directly from the wing section as it is drawn. The effective angle of attack, denoted by α_e, refers to the pure wing section flow rather than to the complete wing air flow. It is only a part of the complete angle of attack. Measured from the chord, α_e is the common effective angle of attack. The absolute effective angle of attack, α_{ae}, is measured from the average direction of the wing section. This gives us the scheme:

	Angle of Attack Measured From	
	Chord	*Average Direction*
Complete Wing Air Flow	α	α_a
Pure Wing Section Flow	α_e	α_{ae}

With the special values for zero lift,
$\alpha = \alpha_e = \alpha_o$ and $\alpha_a = \alpha_{ae} = 0$

It may be said that every portion of the wing section possesses its own local angle of attack, and that the angle of attack of the entire wing section is an average of all local angles of attack. With this conception, we obtain a colorful picture of the wing section action. It is not admissible to average the local angles by attack by their pure geometric magnitude, but rather by taking account of their deflecting power. The trailing edge is much more powerful than the leading edge in forcing its direction on the air. Accordingly, portions of the wing section closer to the trailing edge have a relatively larger guiding power than portions farther in front. The guiding power is not evenly distributed along the chord, but decreases gradually from rear to front. This condition makes it no easy matter to determine the average angle of attack. There is a simple (though only approximate) rule for its determination which we shall discuss later in this article. Before doing so, however, we can at this point draw one general and basic conclusion constituting a fundamental principle of theoretical aerodynamics. Whatever may be the mathematical law governing the relation (*Continued on page* 142)

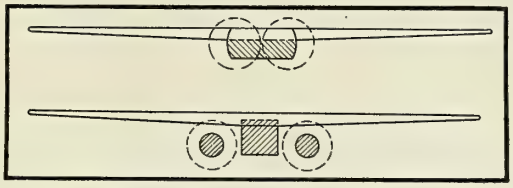


INVESTIGATION OF THE BURNELLI TYPE AIRPLANE

By Dr. Ing. F. Wertenson

PERFORMANCE tests and comparative investigation of the Burnelli UB20 transport yielded important data concerning the design advancement of this type airplane.

The all-wing principle utilizing a superwide fuselage of airfoil contour with multiple engines in the entering edge possesses inherent safety and structural advantages that are obvious. The degree of aerodynamic and structural advantages, however, has been subject to much speculation and question. The results herewith presented, founded on careful research, will clear several technical considerations concerning this trend of design.



Comparison of the frontal resistance areas

The added weight caused by the increased width of the fuselage is more than balanced by the weight savings for the nacelles, their suspension, cowlings, pipelines and engine controls. The following table comparing the Burnelli UB20 to a plane of the nacelle type of similar size, indicates those weights which are affected by the different arrangement. The Burnelli plane proves to be superior by 2.76 per cent of the gross weight.

	Wide fuselage	*Nacelles*
Piping	.11	.40
Exhaust	.49	1.03
Cabin heating	.17	.25
Cowling	.00	.87
Engine controls	.17	.43
Engine mounting	.71	1.86
Tail group	2.23	1.56
Fuselage (*accorded to same standard of equipment*)	10.36	10.60
Total (% of gross weight)	14.24%	17.00%

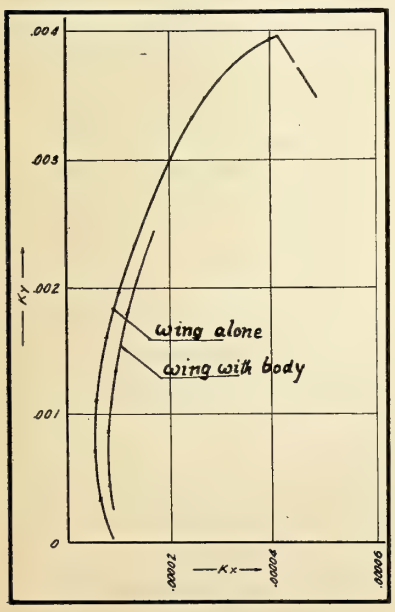
The difference of 2.76 per cent applied to the standard Burnelli plane yields 480 pounds more payload.

The weight of the wing structure is scarcely affected. Nacelles relieve the bending in the wing root essentially, while the wide fuselage avoids this highly stressed section of wing entirely. The balance remains in favor of the wide fuselage, due to the direct transmission of the landing gear shock to the central structure instead of indirectly through the engine suspension and wing truss. This indeed effects more engineering simplicity and safety than weight saving. Other desirable features in this direction inherent to this design are the reduction of the yawing moment for one engine operation because of the reduced distance of the propeller shafts; the accessibility of the engine compartments, allowing minor repairs in flight; and the protection of the passengers by the forward location of the engines and the major structure.

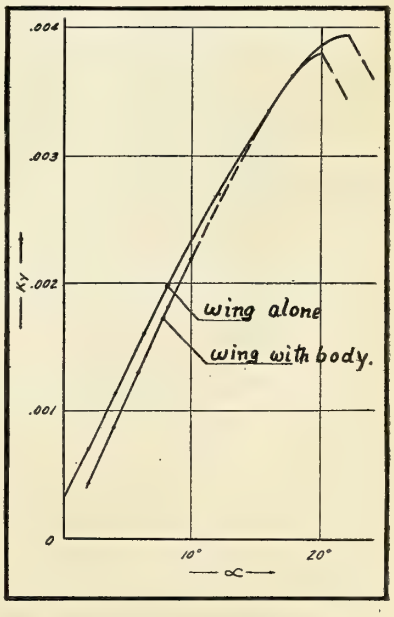
Further investigation of this type of multiple-engine plane manifested that the frontal area of the wide fuselage is less than the frontal area of a conventional fuselage (for the same number of passengers) plus two nacelles. This feature becomes especially evident considering that a fuselage and (to still a greater degree) nacelles, even of the most favorable shape, reduce the lift of the neighboring wing section to about one half as a result of interference effect. The further described investigations show that the body of the Burnelli plane lifts at least as much as the replaced part of the wing. Taking this into consideration, we find that the frontal resistance area of the body is less than five per cent of the total lifting area, whereas fuselage and nacelles of approximately equal sized transport planes average eight per cent of the effective wing area.

The body lift of the Burnelli plane was investigated extensively in wind tunnel research. Several shapes of airfoil fuselages were tested. The one selected was a compromise between the lift over drag ratio and structural suitability. One of the accompanying polar coördinates is for the wing alone and the wing with the body; the other shows the comparison of the lift coefficient with the angle of attack. The interference of the body moves the burble point to an angle of attack two degrees less than for the wing alone and affects the maximum lift slightly; from a short calculation it results that the body lift is about 75 per cent of that of the replaced area of the wing. The reduction of the lift over equal angles of attack is caused by the negative angle of incidence of the fuselage against the wing and

(*Cont'd on p.* 128)



Lift and resistance coefficients



Lift coefficient over attack angle

COMPASSES AND THEIR CARE

By Capt. Leslie S. Potter

THE beginning and the end of all navigation is the compass. Although other calculations and observations have to be made, it is the compass that is used in the application of them. The word "navigation" is used here in its literal sense, as understood in marine matters, to mean the art or science of maintaining a course when out of sight of land, as opposed to pilotage which means the steering of a ship when land is in sight. It is in aerial navigation—i. e., the science of maintaining a correct course in the air when out of sight of land, either above the clouds or over the water—that the compass becomes so essential. In air pilotage—that is, the art of maintaining a course when terrestrial observations are possible—the use of a compass, though equally desirable, is not essential. For the pilot to whom the care and correction of his compass ranks in equal importance with the care and maintenance of his plane (and in this connection it is pointed out that a one-degree error in a compass will mean an error of approximately one mile in every sixty miles flown) the following suggestions may prove useful. Many of them will doubtless have been followed for some time past, but it may happen that the inclusion of one or two new ones will prove of interest.

The Maintenance of Compasses

The delicacy of these instruments is well known, and the observance of the following points may save the owner trouble in the future:

If compasses are not to be installed immediately on their receipt from the makers, they should be kept in the wooden boxes in which they usually arrive.

They may be stored one on top of the other, but they should always remain right side up so that the magnetic system is free to revolve.

Care must be exercised in setting them down even though packed in their boxes. The shock of dropping them even the slightest distance may cause harm.

Never keep compasses near any electrical apparatus such as batteries, dynamos, charging plants, etc. The magnetic system will be weakened thereby.

Be sure that they are examined periodically as to seviceability, water discoloration, evaporation, sticky pivots, etc. Only very rarely does a pilot have to decide on the position for a compass in an airplane. Its location is usually arranged for by the manufacturer, the desiderata being of course ease in reading, accessibility and magnetic conditions. But if it becomes necessary for the pilot to replace a compass, it is well to remember that:

(a) The lubber line is parallel with the fore-and-aft line of the ship when it is in flying position. This is obviously most essential.

(b) The compass is attached rigidly to the plane in such a way that when the ship is in flying position the compass will be truly vertical or horizontal, according to the type used.

(c) The bowl of the compass does not touch any part of the plane, and in securing it to a platform only screws or bolts made of brass or other non-ferrous metal are used.

(d) The corrector-box is immediately below the center of the magnetic system. This is usually provided for by the manufacturer, and a fore-and-aft line is often painted on it. Care must be taken that this is in line with the fore-and-aft line of the compass.

Correction of Compasses

So much for their care and installation. In their correction it is necessary to know the approximate coefficients which cover all the possible magnetic effects in an airplane. They can be resolved into five distinct types which are called by the five capital letters *A* to *E*, inclusive.

Since coefficients *D* and *E* are rarely met with and in few airplane compasses are there any provisions for correcting them, they will not be discussed here. Because coefficient *A* is encountered less frequently than the others, it will be considered last. In the foregoing examples the calculations will be based on the accompanying tables.

Magnetic	*Compass*	*Deviation*
N. (0)	350	+10 (E)
N. E. (45)	42	+ 3 (E)
E. (90)	92	— 2 (W)
S. E. (135)	141	— 6 (W)
S. (180)	188	— 8 (W)
S. W. (225)	227	— 2 (W)
W. (270)	261	+ 9 (E)
N.W. (315)	301	+14 (E)



Pioneer compass and correction card

Coefficient *B* has the same effect a magnet would have if it were lying in the fore-and-aft line of the airplane. Its maximum effects will therefore be on east and west, and its net results may be obtained from the formula:

B = (Deviation on East — Deviation on West) /2

To calculate coefficient *B* from the table given above:

$$B = \frac{-2 - 9}{2} = \frac{-11}{2} = -5°$$

It will be seen that the deviation on west has been changed from +9 to —9, because of the algebraical rule that, when a minus sign precedes the formula, the sign following must always be changed. When correcting for coefficient *B*—that is, for deviation on east and west—the plane must always be headed on either of these points. Here we have a deviation of minus five degrees so that magnets are inserted in the fore-and-aft tubes of the corrector-box, blue poles forward, until the compass reading is changed by five degrees as nearly as possible. The question of which pole is to go forward is easily decided by placing a magnet on the face of a compass and watching which way the card moves. It is sometimes difficult to correct exactly for a deviation. A magnet which is too strong may be reduced in strength by filing or other methods. Snipping ends off the magnet, however, is not recommended, for it leaves too much play for the magnet in the corrector-box. A magnet which has changed its original position will again alter the deviation.

Coefficient *C* has the same effect a magnet would have if it were lying athwartship in the plane, and its maximum effects are found on north and south. Its net results may be obtained from the formula:

C = (Deviation on North — Deviation on South) /2

To calculate from the table above:

$$C = \frac{+10 \quad +8}{2} \qquad \frac{+18}{2} = 9°$$

To correct for this, the plane must be headed on north or south and magnets inserted in the athwartship holes of the corrector-box with red poles to starboard. If it is a minus correction, the blue poles must be to starboard. Sufficient magnets are inserted to change the compass reading by nine degrees as near as possible.

The more rare coefficient *A* may occur because the lubber line of the plane is not parallel with the fore and aft line of the plane, or because of incorrect mounting of the card on the magnet system (this is a manufacturer's error and if serious the compass must be returned for overhaul), or because of the unusual distribution of soft iron in the plane, a condition which is usually avoided in the selection of a position for the mounting of the compass. To calculate for it the sum of the deviations on all the cardinal and quadrantal points is taken and divided by eight. From the table given it would be as follows:

$$\frac{+10+3-2-6-8-2+9+14}{8} = \frac{+18}{8} = +2\tfrac{1}{4}°$$

(Continued on following page)

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(*Continued from preceding page*)

To correct for this the compass must be turned 2¼ degrees in a clockwise direction on its mounting. If it is a minus deviation, the compass must be turned the requisite number of degrees in an anti-clockwise direction. It should be mentioned that the deviations shown on the deviation card have been exaggerated to emphasize the examples. It is seldom that such large deviations are found on a reliable, well-installed compass that has been regularly swung.

The adoption of a definite sequence of operations in compass swinging will greatly facilitate the work, and a sequence is suggested as follows:

It is generally better first to swing and correct for coefficients *B* and *C*. A reliable compass that has once been installed and swung will not suffer any great subsequent deviations unless the distribution of the load or the structure of the plane has been materially altered. Since corrections on the cardinal points will invariably influence the readings of the quadrantal points, it is recommended that these be left till last. The practice of placing a compass on north and then correcting for it, and then performing the same operation on east, south and west is too casual to be satisfactory, and often requires more time than the adoption of the definite sequence.

Sequence	*Compass Reading*	*Deviation*	*Calculations & corrections*
1. Place plane on magnetic north. Enter compass reading in compass log book.	4°	−4°	$C=\frac{-4-6-10}{2}=\frac{-20}{2}=-5°$ Insert magnets athwartships until compass reading changes by 5°. Blue poles should be to starboard. Compass will now read 179° on south and 359° on north.
2. Place plane on east and enter compass reading.	85°	+5°	
3. Place plane on south and enter compass reading.	174°	+6°	
4. Calculate for coefficient *C*.			
5. Enter corrected readings in compass log book.			Devtn. on E. =−5° Devtn. on W. =+6° +5+6 =+5½° / 2 Insert magnets fore-and-aft, red poles forward until reading changes by 5° or 6°. It is not possible to correct for ½°. Assuming you correct for 5° the compass will read 271°.
6. Place plane on west. Enter compass reading.	276°	−6°	
7. Calculate for coefficient *B*.			
8. Enter corrected reading for west.			
9. Place the plane on N. and all the cardinal and quadrantal points, entering the readings obtained in the log book where this has not already been done. Suppose the readings on the various points after corrections had been made as above, were as follows:	N. 359° NE. 44° E. 90° SE. 134° S. 179° SW. 225° W. 271° NW. 315°	+1° +1° 0° +1° +1° 0° 1° 0°	Calculations for coefficient *A* would be as follows: +1+1+1+1−1 / 8 = +⅛° This would be too small to correct for.

On the basis of the above calculations the final readings in your compass log book would be something as follows:

	First Reading	*Corrected Reading*	*Magnets Used*
N.	0°	4°	359°
N. E.	45°	44°	44°
E.	90°	85°	90°
S. E.	135°	134°	134°
S.	180°	174°	179°
S. W.	225°	225°	225°
W.	270°	276°	271°
N. W.	315°	315°	315°

Entry would have to be made under this heading of the size of the magnets used and their positions in the corrector box.

The final operation is the preparation of the deviation card to be placed in position near the compass. A card of the convenient size issued by the Pioneer Instrument Company is shown in the accompanying illustration on the preceding page.

If the compass has been regularly swung, or unless large errors occur or extreme accuracy is required, it is not generally necessary to swing on more than the eight points indicated above. Two or more compasses on the plane may, of course, be adjusted at the same time, and care should be taken to see that the corrector-box is properly closed on the completion of the swing.

NAVY ZEPPELIN TRANSMISSION SYSTEM TESTED

ONE of the power transmission systems destined for use in the new Navy Zeppelin, the *Akron*, recently began a pre-service test. The test, which will run a minimum of 310 hours and may run as long as 500 hours, is devised primarily for testing out the transmission gearing rather than the engines themselves. The Maybach engines, similar to those on the *Los Angeles* and the *Graf Zeppelin*, have already been type-tested and shop-tested, but are subjected to further service to assure that the transmission assembly works efficiently.

New transmission gearing had to be worked out for the eight engines in the *Akron*. In airplane motors the propeller is fitted to the shaft immediately adjacent to the engine. In the *Akron* the engines will be built within the body of the ship so as to reduce resistance, and the power they generate will be transmitted through a shaft extending through the ship's hull to the outside, where the propellers can circulate in the free air. The distance from engine stand to propeller shaft will be 17 feet.

In addition to this, the motors are to be reversible. And a more important innovation still is the device of using swivelling propellers so that the ship can be driven upward or downward, or at an angle, in addition to having forward and astern thrust.

The test run is not to be continuous. There will be 25 test periods of 10 hours' duration each and two of 30 hours, with additional test runs if found desirable. This corresponds in effect to actual practice on board an airship on a transoceanic voyage where the full powerplant is not utilized constantly. Five or six of the eight engines of the *Akron* will carry the ship along at cruising speed.

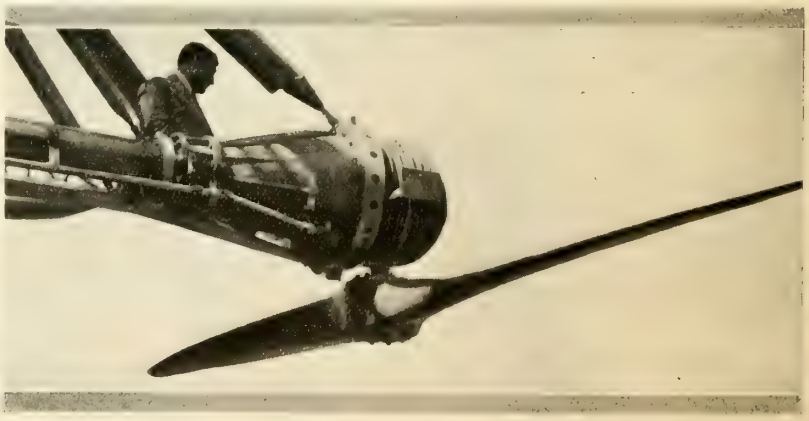
The usual practice on a naval airship during a long trip is to have at least one engine idle, rotating this so as to equalize the running time of the various engines and so allow ample time for en route inspection and the items of minor maintenance that all engines require.

During the present tests at Akron the motor will be driven at different speeds, from cruising to top speed. It will be tested on forward speed and speed astern. It will be tested while the propeller is in vertical position, upward or downward. At least 50 test hours are to be run at full speed.

Since the engine averages about 30 gallons of gas consumption per hour, the test may consume as high as 9,000 gallons of fuel.

The propeller used in the test is of wood, two-bladed, 16 feet six inches long. The engine is mounted on a great test block alongside the Zeppelin shops at Akron, the mounting being an exact duplication of the duralumin girder housing which will be utilized in the finished airship.

The ten-hour test periods are run one a day. The 30-hour test will run all day and all night and into the second day.



Transmission unit of the new Navy Zeppelin "Akron" driving a 16½ foot propeller

KNOWING HOW TO FLY

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AIRTECH

LINDBERGH FIELD

SAN DIEGO - CALIFORNIA

DIGEST OF FOREIGN TECHNICAL ARTICLES

By Elsa Gardner

YAWING MOMENTS AND FORCES

Moments and Forces on a Yawed Model Aeroplane, W. G. A. Perring and C. Callen. Aeronautical Research Committee—Reports and Memoranda No. 1319 (Ae. 455), February, 1930, 3 pp., 3 figs.

MEASUREMENTS of the longitudinal and cross-wind forces and the rolling and yawing moments, taken on a model airplane fitted with R. A. F. 14 wings, are discussed. The model was tested at an angle of incidence of 12.6 degrees and zero roll for angles of yaw varying from 0 to 90 degrees to the wind direction. The values of the rolling moments have also been determined over the same range of yaw angle for plus or minus five degrees roll angle. All results have been referred to body axes.

POLYNOMIAL EQUATIONS

A Study of Polynomial Equations, W. L. Cowley and Sylvia W. Skan. Aeronautical Research Committee—Reports and Memoranda No. 1325 (Ae. 459), February, 1930, 20 pp., 2 figs.

IN order to investigate problems in airplane stability, it was found necessary to have a method for the solution of polynomial equations, which will present no cases of failure, and which will permit a convenient study of the effects of changes in design. In this report, a method is developed for the solution of equations by starting from the zero root which occurs when the last term K is made equal to zero. Formulas are derived from the effect on the root of a small change in K, and the root of the given equation is obtained by a step integration of such small changes until K assumes the value required Other methods for the solution of high order equations are also discussed.

RADIO DIRECTION FINDING

Utilization of the Loth Process for the Direction of Airplanes by Hertzian Waves (Utilisation des Procédés Loth pour le guidage des avions par ondes hertziennes), A. Verdurand and J. Blancard. "Aéronautique," Vol. 12, No. 137, October, 1930, pp. 363-376, 27 figs.

MR. VERDURAND analyzes the radio-direction-finding system being developed by the Société Industrielle des Procédés Loth, while Mr. Blancard, chief engineer of that concern, answers his criticisms and explains further the means his company will take to overcome the practical difficulties encountered.

The system proposes to direct airplanes through fog even over a winding route, and to furnish the pilot with information such as his position with regard to the route, his distance to the airport, and the altitude at which it is necessary to fly at each point in the course. By means of radiotelegraphy, airports will signal the pilot at his approach, giving him directions for landing, the point at which he clears the limits of the airport, and that at which he is only several meters from the ground in landing. Underground cables will take the place of aerials.

The authors agree that, inasmuch as the speeds of rotation of two projectors and their distances to the observer are not equal, the signals he collects in both their ranges are not harmonized and he will hear continuous sounds preceded and followed by dots and dashes. Mr. Blancard thinks any chance for error in interpretation will be avoided with the visual indicator the Loth concern is developing.

In regard to directing planes approaching airports, the authors agree on the division of the magnetic field resulting in the inversion of signals perceived by the observer when the plane clears the airport limits, according to the perpendicular range of the signals. They are in accord concerning the position of uncertain zones, in which the observer will receive not dots and dashes but a continuous sound, and they agree that these zones increase with the altitude of the plane. Mr. Blancard claims, however, that these will give a useful indication of height.

They both estimate that a single perpendicular range covering 10 meters from the ground will be useful to the pilot only during very heavy fog, but Mr. Blancard tells of a new arrangement allowing a higher perpendicular range which warns the pilot at a sufficient altitude to give him time to prepare for landing.

TESTS OF SEAPLANE MODELS

Tank Tests with Seaplane Models, R. J. Mitchell. "Aircraft Engineering," Vol. 2, No. 20, October, 1930, pp. 255-259, 11 figs.

THE author, who is chief designer of the Supermarine Aviation Works, outlines the general procedure for carrying out various tank tests on models, indicating where care is necessary and what precautions must be taken to ensure that model results may be applicable to full-scale design. In regard to these precautions he points out the great importance of considering engine torque in the case of racing seaplanes which develop an enormous torque in relation to size. Where stubs are used for lateral stability, the transverse righting moment may be less when taxying than when at rest because of dynamic effects, and the model should be allowed freedom in roll. With the more normal type of twin-float or single-hull seaplane this complication is generally unnecessary, and tests are satisfactory when pitching movement is permitted.

Design of floats for the S-5 racing seaplane and results of tests on this plane, on the S-6, and on a series of three-engined civil monoplanes with stubs are discussed.

Paper presented before the Fifth International Air Congress.

WING RADIATOR TESTS

Wind Tunnel Tests on Gloster and Supermarine Wing Radiators, R. G. Harris, L. E. Caygill, and R. A. Fairthorne. Aeronautical Research Committee—Reports and Memoranda No. 1311, (Ae. 454), June, 1929, 14 pp., 7 figs.

IN this wind tunnel investigation of the properties of wing radiators, the heat dissipation was measured on the corrugated Gloster radiator and on a smooth Supermarine radiator at wind speeds ranging from 40 to 130 feet per second. Distribution of heat dissipation between upper and lower surfaces, and the effect of painting the surface were determined on the Supermarine. Drag was measured on the Gloster radiator from —2.5 to 3.0 degrees and a lift curve established.

Heat dissipation per unit cooling area, added drag per horsepower dissipated, weight per horsepower dissipated, and equivalent drag horsepower per horsepower dissipated at 40 feet per second were found. It was proved that the Gloster radiator can deal with about 19 per cent more heat than the Supermarine, its corrugations adding 44 per cent to the cooling area, but the radiator increases the drag of that part of the wing to which it is fitted by 24 per cent.

RANGE VARIATION WITH SPEED AND HEIGHT

Flight Tests on the Variation of the Range of an Aircraft with Speed and Height, C. E. Maitland and E. W. Nutt (Appendix, H. T. Tizard). Aeronautical Research Committee—Reports and Memoranda No. 1317 (Ae. 454), June, 1929, 7 pp., 10 figs.

THE tests described in this report were made to obtain evidence regarding an increase in range with height and speed of the airplane. The gasoline consumption of a Vickers Venture aircraft was measured at a series of level speeds at four different heights with the maximum amount of altitude control obtainable at each speed without fall of r.p.m., and also with a weaker mixture.

A definite increase in the range of the aircraft at all speeds occurred with increase of heights with the maximum amount of altitude control possible without a fall of r.p.m. was used. It appears that a large part of the loss of range at low altitudes could be regained if mixtures weaker than those implied by the above amount of altitude control could be used without fear of damage to the engine.

The Appendix points out that the experimental results are contrary to what might be expected on theoretical grounds if maximum fuel economy was obtained under all conditions, and gives Mr. Tizard's opinions for the causes of the discrepancies.

ALUMINUM ALLOYS

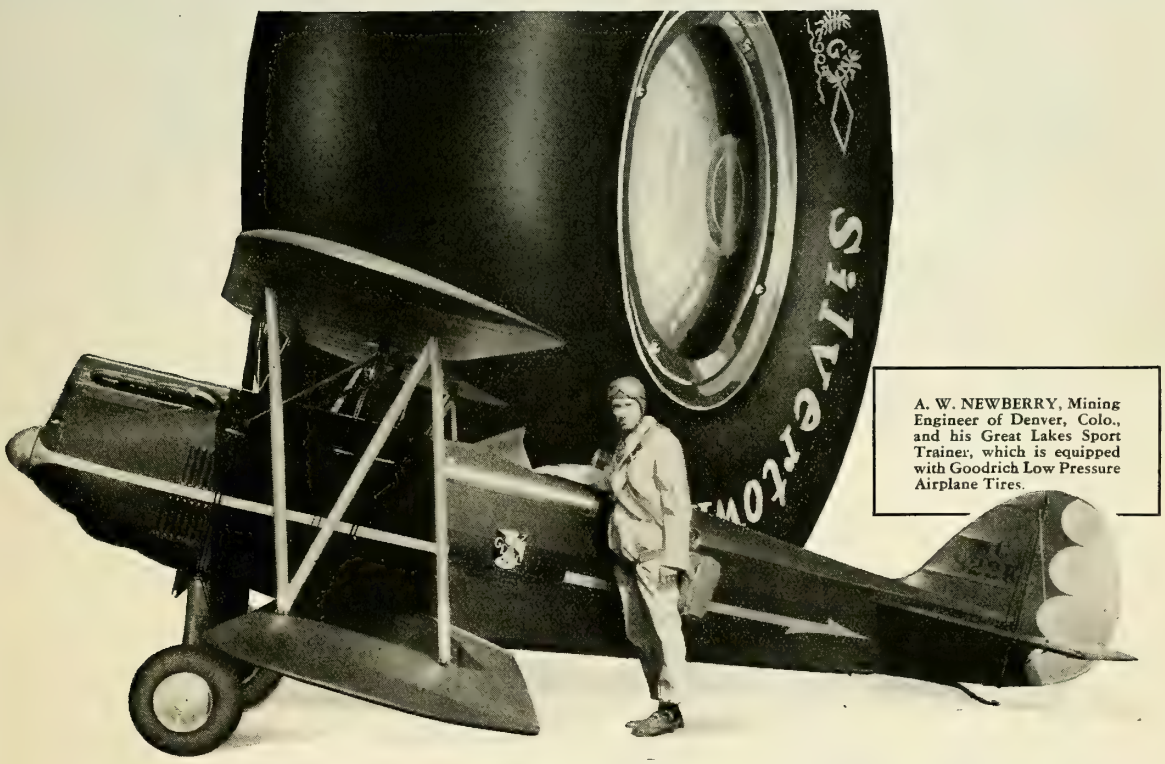
Aluminum Alloy Manufacture, "Automobile Engineer," October, 1930, pp. 357-364, 25 figs.

THIS is a description of the commercialized laboratory methods employed by High Duty Alloys, Ltd., Slough, in the manufacture of aluminum alloys which are the outcome of experimental work carried out in the Rolls-Royce laboratory. The engine installed in the winning plane of last year's Schneider Trophy Race had a crankcase, cylinder block and cylinder head, together with other aluminum castings in RR alloy.

Attention is concentrated on the quality of the material manufactured without regard to quantity of output, and the shops and foundries are directly under laboratory control. The composition and physical properties of Hiduminium RR-50, Y-alloy, and RR-53 are discussed with the results of heat treatment of various parts. An interesting system evolved for dissolving nickel into aluminum alloys is explained.

(Continued on following page)

EVERY OPEN SPOT A LANDING FIELD



A. W. NEWBERRY, Mining Engineer of Denver, Colo., and his Great Lakes Sport Trainer, which is equipped with Goodrich Low Pressure Airplane Tires.

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(*Continued from preceding page*)

Forging, stamping, casting, heat-treatment and testing equipment is illustrated and results obtained in X-ray examination of the metals are shown. Reasons for special attention to pattern designs are also referred to.

AIRCRAFT REGISTRATION

The Aircraft for Public Service and the Standard for Skill Required by the Italian Registrar (Gli aeromobili per servizi publici e le norme di abilitazione del Registro Italiano), G. Magaldi. "Aerotecnica," Vol. 10. Nos. 9-10, September-October, 1930, pp. 673-689.

THE character of the government organizations which control airplane construction and the aeronautical services are described, and the results of a registration of aeronautical classifications are explained with particular reference to the Italian Registrar. The significance of the aeronautical classifications is pointed out with the benefits effected by technical inspection. The new regulations of 1930 are illustrated, and the principal standards to be considered in regard to safety are discussed.

Paper presented before the A.I.D.A.

AIRPLANE LANDING GEAR

Undercarriages for Airplanes (Sui Carrelli per Aeroplani), S. Maiorca. "Aerotecnica," Vol. 10, Nos. 9-10, September-October, 1930, pp. 689-745, 70 figs. Bibliography.

WITH a careful investigation into particulars, the author describes the elements which constitute the airplane landing gear, that is, the frame, the wheels and the shock absorbers. He not only takes up known types of brakes and servo-brakes, but also explains in detail the designs of special wheels now proposed for aircraft in which are located internally elastic parts with the function of shock absorbers. The author has designed a wheel on the same principles, which he demonstrates in detail.

AIRPLANE TESTING

A Method for Testing the Properties of Airplanes (Anweisung für die Prüfung der Eigenschaften von Flugzeugen), W. Hübner. "Zeitschrift für Flugtechnik und Motorluftschiffahrt," Vol. 21, No. 20, Oct. 28, 1930, pp. 529-533.

SIMPLE procedures are shown by means of which it is possible to make a qualitative test of the properties of airplanes. These procedures embrace tests of ground performance, equilibrium conditions, stability, controllability, maneuverability, directional stability, set-up tests, and tests of the pilot's cockpit. Instructions for tests of the sources of vibration are included. There are considered also those fittings for airplanes which are of importance in its control and are necessitated from the standpoint of safety.

Report of the Deutschen Versuchsanstalt für Luftfahrt.

POSSIBLE CAUSES OF THE CRASH OF THE R.101

The Accident to the R.101, "Aircraft Engineering," November, 1930, Vol. 2, No. 21, pp. 278-280, 5 figs. See also Editorial, pp. 271-272.

A RECAPITULATION of the airship's history and the circumstances of the last flight are given, and possible causes of the crash are discussed. Weather conditions at Beauvais are quoted. Photographs indicate that there was no telescoping of the transverse frames longitudinally and that they collapsed vertically. This evidence seems against the theory that the ship was diving at the moment of impact. The possible causes listed include the facts that: Further chafing of the gas bags might have led to leakage, but this should have shown itself by gradual loss of lift that would have been reported; pitching might have produced surging on the bags causing the "parachute" wiring to give way; in spite of the flaps fitted inside the air-inlet holes forming a ring around the bow, sufficient moisture might have been driven in to cause the opening of the seams of the foremost gas bag. These seams were, as also in the R.100, merely stuck, not sewn, with a flexible glue which is soluble in water. Any of these could have accounted for the presence of an inflammable hydrogen-air mixture sufficient to cause explosion.

SUPERCHARGING

The Supercharging of Internal Combustion Engines—The Recent Applications of the Ideas of Mr. Rateau (La suralimentation des moteurs à combustion interne—les applications récents des idées de M. Rateau), R. Anxionnaz. "Genie Civil," Vol. 97, No. 20, Nov. 15, 1930, pp. 455-458, 5 figs.

SUPERCHARGING of internal combustion engines by the use of the energy available in the exhaust gas of the engine is the idea which appealed more particularly to the late M. Rateau, although supercharging can be obtained by the assistance of other sources of energy. The author, who was one of the collaborators of the late M. Rateau, discusses the results that one may hope to obtain in supercharging of engines and those already obtained, especially with aviation engines.

The Rateau supercharger is mechanically controlled by the engine it supercharges. Power and consumption curves of an airplane engine thus supercharged at high altitudes are given. Its application to the airplane engine has been made possible by gearing at high speed and controlled in flight, which was invented by Engineer Waseige of Maison Farman. Results of tests with an airplane engine thus supercharged at an altitude of 5,500 meters are discussed.

Test results with a four-cycle Diesel engine, not supercharged, but having a normal compression chamber, one not supercharged, but with a compression chamber increased for supercharging, and with a supercharged Diesel, are compared. It is stated that not only may the power of the Diesel be increased by 40 per cent without an increase of temperature of the oil and water, but that the heating of the water is reduced from 33 to 23 degrees and that of the oil from 27 to 13 degrees. Future supercharging developments in aviation are also predicted.

Paper presented before the Société des Ingénieurs Civils and printed in their Bulletin, May-June, 1930.

RADIO RESEARCH

Experiments in the Regulation of Quartz-Controlled Transmitters (Untersuchungen über das Verhalten von Quarzgesteuerton Sendern), P. Von Handel. "Luftfahrtforschung," Vol. 8, No. 5, pp. 121-136, 14 figs.

THE electric spare-switch diagram of the oscillating quartz crystals is derived and it is demonstrated that the dampening of the crystals is proportional to the natural frequency. The specific elongation is computed as the function of the electric voltage of the crystal whereby it is proved that the specific elongation is independent of the frequency. The vector equation of the oscillating systems is calculated, and the oscillating parts are investigated with the help of vector diagrams. The stability calculations show the possible stable and unstable oscillations.

The regulation of quartz-controlled double-arced transmitters in an over-critical coupling is determined, as is the influence of the grid effective current and the grid anode capacity. It is seen that the influence of the grid equivalent current on the oscillating procedures is extremely great, and, therefore, it behooves one to use quartz-controlled transmission tubes with the least possible grid current. A spare return coupling has certain disadvantages and is not recommended for short-wave senders. An enlarging of the grid anode capacity when longer waves are employed can be of little use for the Huth-Kuhn switch, and in this case one must resort to the spare return coupling.

Report of Deutschen Versuchsanstalt für Luftfahrt.

AERODYNAMICS

Experimental Results Relating to a New Phenomenon in Aerodynamics (Risultati sperimentali ad un nuova fenomeno di aerodinamica), G. A. E. Raimondi. "Notiziario Tecnico di Aeronautica," Vol. 6, No. 10, October, 1930, pp. 1-19, 33 figs.

THE results of the author's first experiments with a new phenomenon in the field of hydro-aerodynamics are reviewed, with a description of a second series which checked these results.

A rectangular plate was inclined near a plane with the long side parallel to it (it was possible for the plane also to be a rigid plate of the same length, but much larger), the whole system being immersed in a fluid at rest. When the plate was rotated rapidly about its longest axis parallel to the plane, an attractive force was produced between the plate and the plane, which depends upon the velocity, distance between the plate and plane, nature of the fluid, and nature of the plate and plane surfaces. All other conditions being constant, when the distance was constant, the force increased with increase of velocity. At a constant velocity, when the distance was increased, the force first increased and then decreased and the point of maximum force determined.

The author also discusses analogous phenomena. In one the rotating member takes the form of a cylinder instead of a plate, and in another the rotor is placed eccentrically inside a rigid hollow cylinder instead of in the vicinity of a plane. The following cases were investigated: A cylinder plane with cylinder diameter of 225 millimeters and of 280 millimeters; a plate-plane; a wheel with plain blades; a wheel with curved blades; a cylinder within a cylinder; a plate in a cylinder; a wheel with blades in a cylinder; a wheel with curved blades in a cylinder.



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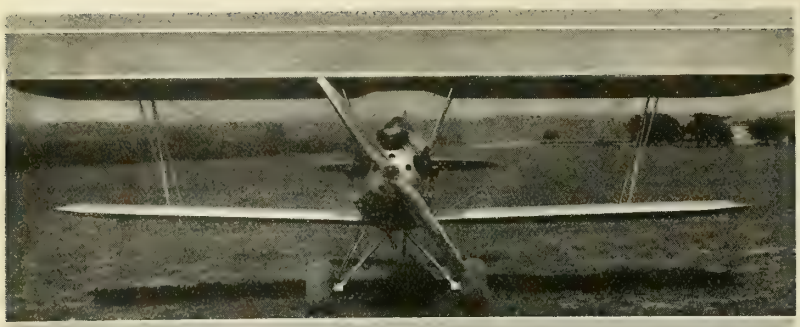
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FRANKLIN SPORT PLANE

DESIGNED primarily for the individual, business representative, sportsman, flying club, or student pilot, the Franklin Sport Models 65, 70, 85 and 90, produced by Franklin Aircraft Corporation, Franklin, Pa., are all two-place dual control open-cockpit land biplanes with the following engine installations respectively: Lambert Velie M-5, LeBlond 70, LeBlond 85 and Lambert 90 with a range of 65 to 90 horsepower. Much of the purpose of this design has been the elimination of the peculiarities most common in small airplanes, especially at stalling speeds. The performance combines maneuverability with stability, and the plane will fly "hands off" on a straight course. These models have been stressed throughout with a safety factor of seven.

The airfoil is the Aeromarine 2A. The wings have a stagger of 22 degrees and a gap chord ratio of 1:05, giving each wing monoplane efficiency. The ailerons with an area of 18 square feet are mounted only to the lower wings and have a full Frise movement. The spars throughout the wings and ailerons are of solid Sitka spruce. The ribs are of the same material glued with plywood and nailed. The wings are internally braced with Macwhyte tie-rods with safe lock terminals. The streamline flying, landing and bracing wires are of the same type. The wings are wired for navigation lights. Visibility and ease of getting in and out of the front cockpit are enhanced by having the center section cut out. The wings are covered with a high grade of fabric and ventilated to prevent moisture from forming and remaining internally.

The fuselage is of the tandem seat type, constructed of Summerill welded chrome-molybdenum and 1025 S.A.E. specification steel tubing varying in size from ⅝-inch to one inch in diameter, 16 to 20 gauge. The modified Warren-Pratt system of truss bracing has been used throughout. The control system in the fuselage utilizes bronze bushings. The tail skid is of the spring leaf type with detachable shoe. The elevators are controlled by push and pull tubes, the rudder by flexible cables with rudder pedals in both cockpits.

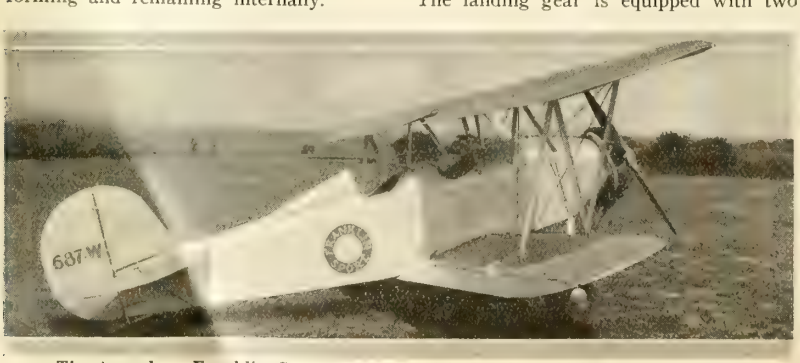
The tail surfaces are constructed of chrome-molybdenum and 1025 S.A.E. Summerill steel tubing. The rudder, which has a surface of five square feet, has an angular trend of 28 degrees. The stabilizer, with an area of 11.3 square feet, is screw adjustable from the pilot's cockpit through a range of five degrees. The area of the elevators is 10.5 square feet and the fin 3.6 square feet. The fabric used in covering the tail surfaces, fuselage and wings is sewed in sock form and drawn on before being stitched to the ribs or otherwise fastened.

The gasoline and oil tanks are of welded aluminum of 16 gauge and treated against corrosion. The capacity of the gasoline tanks in the 65 and 70 models is 18 gallons and for the 85 and 90 models 24 gallons. The gasoline and oil fittings are Lunkenheimer brass fittings. The gasoline line is equipped with a Stromberg Gasculator. The gasoline gauge may be seen from either cockpit.

The landing gear is of the split-axle type, equipped with oleo shock struts. The landing gear is equipped with two Goodyear Airwheels, size 22 by 10, having a tread of 58 inches.

Standard equipment on all models includes wood propeller, A.P.C. Balloon Wheels, oleo shock struts, dual stick control, parachute seats with cushions, gasoline gauge, Consolidated instrument panel, wiring for navigation lights, fire extinguisher, first-aid kit, altitude adjustment on carburetor, Stromberg gas filter, map and log book case, and baggage and tool compartment.

One of the features of the Franklin Sport is the interchangeability of motors using the same motor mounts, which are detachable. These changes can be made without any change in the airplane whatever, inasmuch as it is stressed and constructed for this interchangeability.



The two-place Franklin Sport powered with Lambert 90-horsepower engine

Specifications

(Applicable to all models except where otherwise indicated.)

Span	26 feet
Length	19 feet 6 inches
Chord, both wings	48 inches
Mean chord ratio	50:5
Stagger	22 degrees
Incidence, upper wing	2½ degrees
Incidence, lower wing	2 degrees
Dihedral, lower wing only	2 degrees
Area, upper wing	100.5 square feet
Area, lower wing (incl. ailerons)	84.5 sq. ft.
Total wing area	185 square feet
Fuel capacity, models 65 and 70	18 gals.
Fuel capacity, models 85 and 90	24 gals.
Oil capacity	2¼ gals.

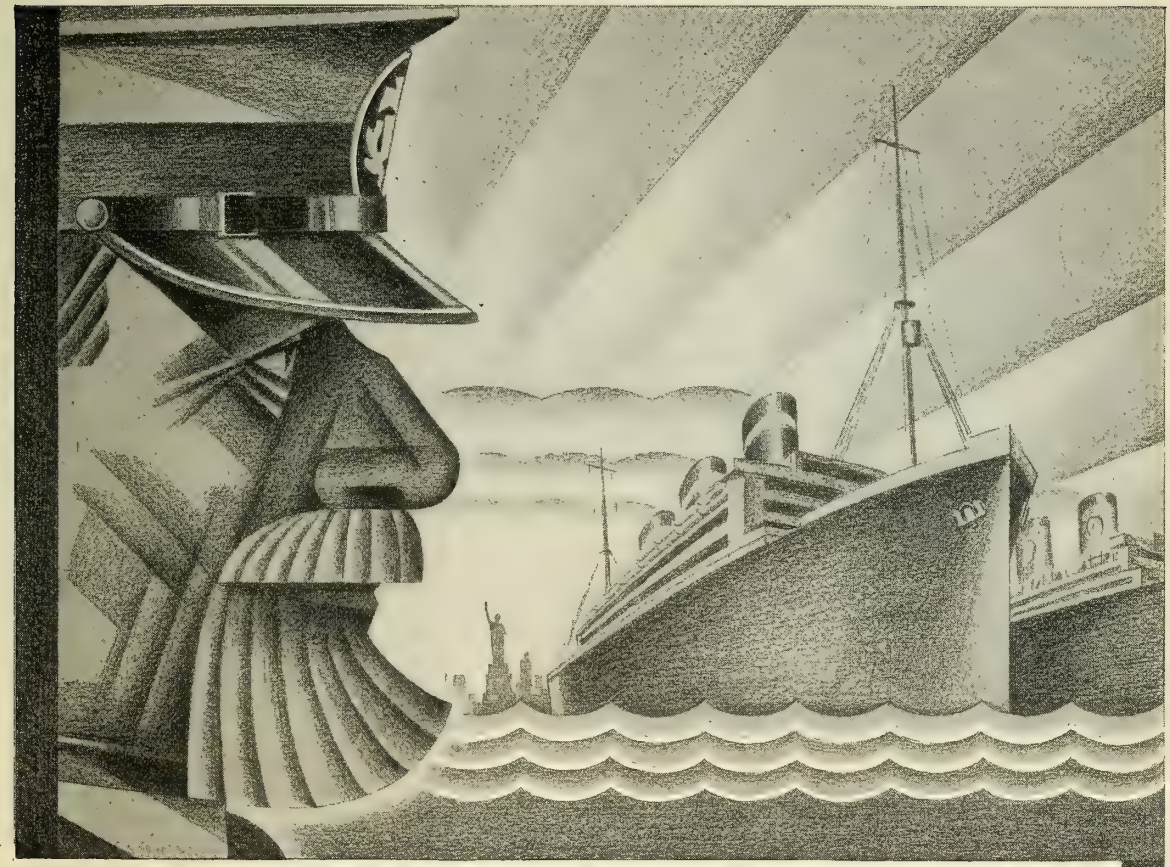
Weights and Loadings

Gross weight (stressed)	1,500 pounds
Gross weight, model 65	1,312 pounds
Gross weight, model 70	1,320 pounds
Gross weight, model 85	1,423 pounds
Gross weight, model 90	1,418 pounds
Useful load, models 65 and 70	467 pounds
Useful load, models 85 and 90	570 pounds
Wing loading, model 65	7.08 lbs. per sq. ft.
Wing loading, model 70	7.13 lbs. per sq. ft.
Wing loading, model 85	7.69 lbs. per sq. ft.
Wing loading, model 90	7.64 lbs. per sq. ft.
Power loading, model 65	21 lbs. per h.p.
Power loading, model 70	18.8 lbs. per h.p.
Power loading, model 85	16.7 lbs. per h.p.
Power loading, model 90	15.7 lbs. per h.p.

Performance

(Estimated)

Model 65	
High speed	100 miles per hour
Cruising speed	80 miles per hour
Landing speed	30 miles per hour
Climb	550 feet per minute
Model 70	
High speed	105 miles per hour
Cruising speed	85 miles per hour
Landing speed	30 miles per hour
Climb	600 feet per minute
Model 85	
High speed	115 miles per hour
Cruising speed	100 miles per hour
Landing speed	30 miles per hour
Climb	850 feet per minute
Model 90	
High speed	120 miles per hour
Cruising speed	105 miles per hour
Landing speed	30 miles per hour
Climb	900 feet per minute



MARINE

The captain commands. Thousands of mechanical devices stir into action, smoothly, quietly . . . . the great ocean liner — a city in itself.

Behind countless devices in the assembly of this marvel of oceanic transportation — precision . . . . mechanical perfection — the grinding machine and the grinding wheel have been busy.

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RECENT AIRCRAFT PATENTS

THE following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trademark attorney, 1343 H Street, N. W., Washington, D. C., at the rate of 20 cents each. State number of patent and name of inventor when ordering.

High altitude flying machine. Richard Diehl, New York, N. Y. (1,779,160).

Endurance high altitude flying machine. William H. Evers and Richard Diehl, New York, N. Y. (1,779,162).

Automatic landing control for aeroplanes. Walter L. Isom, Crows Landing, Calif. (1,779,168).

Aircraft powerplant. Jan Pavlecka, Wyandotte, Mich. (1,779,186).

Main ring for rigid airships. Karl Arnstein, Akron, Ohio; assignor to Goodyear-Zeppelin Corporation, Akron (1,779,387).

Method of coating fabrics and products derived therefrom. William C. Calvert, Evanston, Ill.; assignor to Goodyear Tire & Rubber Company, Akron, Ohio (1,779,388).

Gas-proof balloon fabric. Clarence M. Carson, Akron, Ohio; assignor to Goodyear Tire & Rubber Company, Akron (1,779,389).

Method of making gas cell material. Karl Huerttle, Akron, Ohio; assignor to Goodyear-Zeppelin Corporation, Akron (1,779,395).

Fuel tank. Herman T. Kraft, Akron, Ohio; assignor to Goodyear-Zeppelin Corporation, Akron (1,779,397).

Rudder-compensating device. Richard Liebert, Akron, Ohio; assignor to Goodyear-Zeppelin Corporation, Akron (1,779,398).

Helicopter. Engelbert Zaschka, Berlin-Neukolin, Germany (1,779,524).

Aerial gas bomb. August Pavola, McMurray, Wash. (1,779,617).

Emergency propeller for aircraft. Herman Silver, Minneapolis, Minn. (1,779,644).

Undercarriage construction for aircraft. William F. Bell, Britannia Bay, Ontario, Canada (1,779,690).

Combined airplane wing and radiator system. Arthur L. Thurston, Freeport, N. Y. (1,779,718).

Amphibion aircraft. Albert E. and Hugh O. Short, Rochester, England (1,779,754).

Airplane landing gear. Thomas Carroll, Hampton, Va. (1,779,801).

Sustaining wing structure. William F. Gerhardt, Dayton, Ohio (1,779,842).

Aircraft covering. Isadore M. Jacobsohn, Chicago, Ill., and Starr Truscott, Birmingham, Ohio (1,779,846).

Flexible impermeable fabric. Isadore M. Jacobsohn, Chicago, Ill., and Starr Truscott, Birmingham, Ohio (1,779,847).

Glider. Jean A. Roché, Dayton, Ohio (1,779,855).

Safety device for aeroplanes or the like. Joseph C. Bechard, Fall River, Mass. (1,779,871).

Radiator system for airships. Louis Bréguet, Paris, France; assignor to Société Anonyme des Ateliers d'Aviation Louis Bréguet, Paris (1,779,898).

Automatic pilot. Elmer A. Sperry, Jr., Brooklyn, N. Y.; assignor to Sperry Gyroscope Company, Brooklyn (1,779,991).

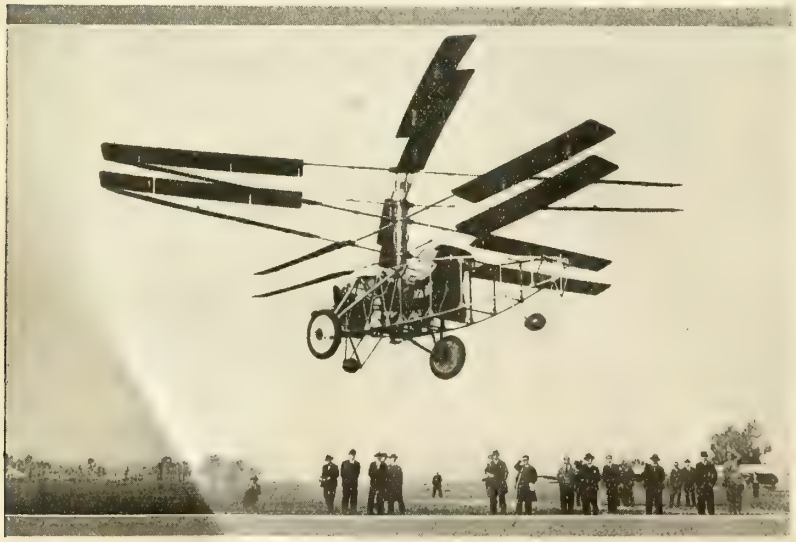
Constant period (gyro) compass. William R. Hight, Hollis, and Lawrence Wainwright, Brooklyn, N. Y.; said Hight assignor to Sperry Gyroscope Company, Brooklyn (1,780,014).

Transverse frame for rigid airships. Vincent C. Richmond, Harrow-on-the-Hill, and George H. Scott, Purley, England (1,780,041).

Aeroplane. Anton Rober, Milwaukee, Wis. (1,780,043).

Aeroplane hangar. William R. Watt, Wilmington, Del. (1,780,102).

Parachute and pack therefor. Herbert L. Adams, Washington, D. C.; assignor to Irving Air Chute Company, Buffalo, N. Y. (1,780,104).



P. & A. Photo

The latest Pescara helicopter in flight at Barcelona, Spain

Parachute. Edward L. Hoffman, Dayton, Ohio (1,780,190).

Craft adapted to travel on land or water or in the air. Jean B. Icre, New York, N. Y. (1,780,298).

Method of determining drift of aircraft. Chester A. Snow, Jr., Washington, D. C. (1,780,369).

Aeroplane. Frank Tupta, Cleveland, Ohio (1,780,410).

Aero propeller. Charles McCarroll, Helena, Ala. (1,780,431).

Metallic airship of the rigid type. Thomas S. Slate, Glendale, Calif.; assignor to Slate Aircraft Corporation (1,780,448).

Aircraft motor. Stephen Juner Velton, Houston, Texas (1,780,450).

Pneumatic suspension for airplanes. George L. R. J. Messier, Montrouge, France (1,780,531).

Aeroplane. Conrad H. Matthiessen, Jr., New York, N. Y. (1,780,561).

Aeroplane. Arnold G. Parker, Flushing, N. Y.; assignor to Conrad H. Matthiessen, Jr., New York, N. Y. (1,780,565).

Framework structure for steering-gear of airships. Johann Schuette, Lichterfelde-Ost, Germany (1,780,569).

Impelling device. John H. Davis, New York, N. Y.; assignor to Air Line Transportation Company, Philadelphia, Pa. (1,780,580).

Shock absorbing strut. John F. Wallace, Shaker Heights, Ohio; assignor to Cleveland Pneumatic Tool Company, Cleveland, Ohio (1,780,659).

Shock absorbing strut for aircraft. John F. Wallace, Shaker Heights, Ohio; assignor to Cleveland Pneumatic Tool Company, Cleveland, Ohio (1,780,660).

Aeroplane. Tyrrell H. Duncombe, Miami, Fla. (1,780,672).

Means of airfoil and fuselage connection. Vincent J. Burnelli, New York, N. Y.; assignor to Uppercu-Burnelli Corporation, New York (1,780,812).

Airplane. Vincent J. Burnelli, New York, N. Y.; assignor to Uppercu-Burnelli Corporation, New York (1,780,813).

Means for controlling aeroplanes. Frederick H. Page, London, England; assignor to Handley Page, Limited, London (1,780,838).

Aircraft. Vincent J. Burnelli, New York.; assignor to Uppercu-Burnelli Corp. (1,780,993).

Airship mooring-mast gear. Archibald Hall-Brown, Purley, and Edwin W. Jones, Lincoln, England; assignors to Babcock & Wilcox Co., Bayonne, N. J. (1,781,010).

Rigid airship. Charles D. Burney, Barnes N. Wallis, Nevil S. Norway and John E. Temple, London, England; assignors to Airship Guarantee Co., Ltd. (1,781,100).

Wing for aircraft. Edmund B. Cairns, New York, N. Y.; assignor to Cairns Development Co., Wilmington, Del. (1,781,159).

Aerofoil. Edmund B. Cairns, New York, N. Y.; assignor to Cairns Development Co., Wilmington, Del. (1,781,160).

Safety aeroplane. Joseph Leopold, New York, N. Y. (1,781,182).

Automatic control for airplane flotation apparatus. Edwin Mayman, San Diego, Calif. (1,781,291).

Light Weight Volt-Ammeter

IN certain types of airplanes it has been customary to provide in the the battery circuit a direct current ammeter for indicating the charging rate, or the current drain upon the battery, and a D C voltmeter for indicating the voltage of the battery. Two separate instruments have heretofore been provided, the ammeter usually being a flush mounted two-and-a-half-inch instrument of the D'Arsonval type calibrated 30-0-30 amperes or 50-0-50 amperes, and the voltmeter being calibrated 0-20 volts or other voltage as required by the number of cells used.

The Westinghouse BX volt-ammeter recently developed combines these two instruments in one, thereby reducing the weight of the total equipment to about one-half of its former value. The new instrument weighs seven ounces complete with all terminal clips and mounting screws. It is entirely self-contained, and the dial is marked 50-0-50 amperes and 20-0-20 volts as shown in the accompanying illustration. This particular instrument is designed for use with a 12-volt battery, but other combinations of ranges are made for different battery voltages or current requirements.

The diagram shows the method of connecting the instrument in a battery circuit. Assuming the positive terminal of the battery to be grounded, the common terminal of the instrument is made negative and connections are made fundamentally as shown. The instrument normally indicates amperes, either charge or discharge, but upon pressing the push-button the instrument indicates battery voltage.

A reading of battery voltage is of great value in determining the condition of the battery or in locating trouble such as a loose joint, a defective cutout, or a broken wire. With the generator switched off or not running, and with a normal load upon the battery, it is possible to tell roughly the amount of charge in the battery by reading its voltage. A battery which is nearly exhausted will read several volts lower than one which is fully charged. If a defective connection develops around the battery terminals, the voltmeter reading will be considerably higher than the maximum battery voltage when the generator is running. In case of a broken wire near the battery the voltmeter will indicate generator voltage or will go completely off scale showing the nature of the fault.

The combination of a voltmeter and an ammeter in this small space was made possible by the development of a high resistance winding suitable for both voltage and current measurement. The instrument contains a heavy shunt which is connected across the meter mechanism, also a resistance spool which is connected in series with the mechanism. The mechanism is changed from one circuit to the other by a simple built-in push-button which is very light in weight and which requires no extra wiring or mounting. The accompanying rear view of the instrument shows the push-button at the bottom and the three terminal studs at the top. Heavy copper terminal clips are provided for attaching wiring to these terminals.

The dial of the instrument is provided with luminous markings on a black background.

TWO NEW STANLEY 3/16″ ELECTRIC DRILLS

THE development of two new three-sixteenth-inch Electric Drills has just been announced by the Stanley Electric Tool Company. They are production drills, weighing three and one-quarter pounds, and are eight and one-quarter inches long. They are particularly adapted for working in places hard to get at in airplane assembly, etc.

The difference in the two drills is in the housing. No. 361 has an aluminum alloy housing not liable to damage if dropped. The housing of No. 361B is made of a special composition that insulates against heat, making it a comfortable tool to handle when drilling continuously for long periods.

The special features as enumerated by the manufacturer are: Armature shaft supported on large seal type ball bearings. No side play at chuck spindle because radial ball bearings are used on each end of spindle. Handle can be quickly taken off or put on as required. The gears are nickel steel specially heat treated. Quick make and break line switch, 12½ feet of rubber covered cable. Universal motor. Chuck speed with no load is 3,000 revolutions per minute; full load, 2,000 revolutions per minute. Can be furnished for either 32, 110, 150, 220 or 250 volts as specified.

SPEEDMATIC SAW

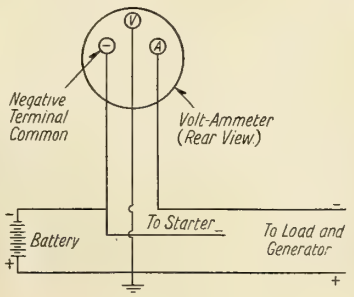
THE Porter-Cable-Hutchinson Corporation (formerly Porter-Cable Machine Company and the Hutchinson Manufacturing Company) of Syracuse, N. Y., has recently placed on the market a new hand power saw known as Speedmatic Saw, Type K-9. This saw is gear-driven. The motor is one and one-quarter horsepower and is geared to the drive arbor through hardened spiral gears having a reduction ratio of two-and-one-seventh to one. This drives the nine-inch saw blade at an unusually high speed for this type of saw, running at 5,000 revolutions per minute free speed, and about 4,000 revolutions per minute under the average cutting load. Type K-9 will cut a maximum depth of three and one-eighth inches. Both depth and angle adjustments are easily made by turning a thumbscrew.

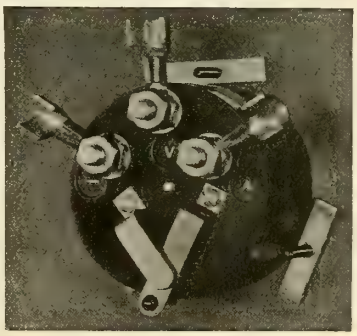
Because of its compact and well-balanced construction, this Speedmatic saw can be operated with one hand. However, an auxiliary knob on front can be used for guiding if required. This same knob also controls the angle adjustment.

ELECTRIC-HEATED COVERS FOR AIRCRAFT ENGINES

A RECENT development in electrically heated motor covers permits convenient starting of radial and other aircraft engines. This work, undertaken by Air Transport Equipment, Inc., of Garden City, N. Y., does away with heating of the engine oil. These heated motor covers are made to fit any aircraft installation. Zippers are used to close the covers tightly. The warming up operation requires from 10 to 30 minutes, depending on the weather. There are no moving parts nor danger of fire. The current consumed is small, either AC or DC. The heating unit is removable so that the motor cover can be used as an ordinary protection against weather.







Westinghouse combined voltmeter and ammeter



HANDLEY PAGE FORTY-SEATER

THE underlying principles in the design and construction of the new Handley Page Type 42, the first of which, called the *Hannibal,* has been flown successfully by Squadron Leader England and Captain Cordes at Radlett airdrome, Hertfordshire, England, derive from experience with other machines built by Handley Page, Ltd. Eight of these machines have been ordered by Imperial Airways at a total cost for the whole equipment of more than $970,000. These new airliners will be used by Imperial on its European and Empire routes. Each ship is driven by four Bristol Jupiter engines. If any one of these power units should fail while in the air, the machine can continue in flight on the other three. Although, when fully loaded, the Handley Page 42 weighs approximately 13 tons, it has a maximum speed of 120 miles an hour and cruises at 105 miles an hour.

The aircraft embodies many interesting features of design and construction, which are described in this article. For much of the technical information presented herewith we are indebted to the New York office of Imperial Airways and to our British contemporary, *Flight* magazine.

To reduce the noise of propellers and engines, the cabin has been placed below the lower wing, and the luggage and lavatory accommodations arranged in the portion of the cabin that lies between the propellers, so as to afford an efficient sound-damping bulkhead for the rest of the cabin. The low position of the cabin permits entrance for the passengers without the need for steps, and the windows below the wing give an uninterrupted view both downward and outward for all the passengers.

Sound-damping has been further enhanced by the provision of a rigid metal skin on the saloon which eliminates noise from the flapping of fabric. The whole of the space between the skin and the interior decoration is padded with Balsam Wool, and the floor is covered with carpet.

The interior of the fuselage is divided into three compartments aft of the pilots' cockpit, which is situated in the bow. Immediately behind the pilots' cockpit is the wireless room. Aft of this is the forward saloon containing seating accommodation (four abreast) for twenty passengers. In the center on the right-hand side is situated the luggage compartment. On the left-hand side are two lavatories and the buffet. Behind this section is the after cabin with seating accommodation for twenty. Two entrance doors are provided, one aft of the saloon and the other leading to the front saloon and pilots' cockpit.

The interior decoration can be best judged by reference to the accompanying illustration on the opposite page.

The normal supply of fresh air to ventilate the passenger cabin is taken from the outside of the center slipstream near the roof of the saloon. The air is led by pipes to the tubular members of the light luggage racks as on existing Handley Page machines, where it is diffused through slots. This air may be warmed if desired by tapping off into it a part of the hot air supply through a regulating valve adjacent to the hot-air valve. There is a control to this air supply at each pair of seats, and the amount is sufficient to give the requisite change of air.

In addition, an independent supply of fresh air is obtained from large adjustable intakes situated just aft of the pilots' cabin. This air supply is led through large semi-circular ducts in the cabin roof.

The warming of the cabin is accomplished by hot air drawn from a muff at the engine exhaust system, the air being taken from a point on the leading edge of the upper wing in order to preclude the possibility of oily vapor entering. The air is led down to a regulator, where it can be mixed with cold air to get any desired temperature. The control to this valve is placed in the corridor between the saloon and the buffet.

The fuselage is built up in two sections—the forward section, which is metal covered, and the tail section (joined to the former by four pin joints), which is fabric covered. The main forward section is of metal monocoque construction, while the rear is of welded steel tube construction. The duralumin longerons of the forward portion are in the form of two corrugated strips with flat flanges, placed face to face so as to form nearly a circular section tube with flat projecting flanges. The fuselage formers or frames, of large size channel section duralumin, are attached to the longerons by angle-section brackets, and the Alclad plating or covering is riveted to longeron flanges and frames. The planking, although having deep fore-and-aft corrugations, is not relied upon exclusively for the bracing of the fuselage structure. Between vertical frames are diagonal members of "X" formation, riveted to the planking and joined together, where they cross each other, by gussets of sheet duralumin.

The rear part of the fuselage consists of a four-sided tubular structure with tie-rod bracings, with sides slightly flared to form continuous curves from the forward duralumin cabin.

The arrangement of the upper and lower wings, of unequal span and area, is the outgrowth of experience with the rigid type of bracing (no wires) adopted by the firm to give the most economical proportioning of weight for spars and struts. The construction of the wing panel is similar to that used in the firm's military machines—namely, spars of corrugated duralumin and ribs of duralumin tubes. The joints are of stainless steel.

The upper wings are fitted with Handley Page automatic slots. The auxiliary airfoils of the slot mechanism are of a new form of construction, with single spars of Z-section duralumin and a planking or skin of sheet duralumin. The top planking is in the form of narrow sheets with their lateral edges bent up for riveting to the plain, unflanged ribs.

The ailerons are of the slot type, and have single spars of circular-section duralumin tube, with tubular ribs. Each aileron is carried on four hinges, supported on box section brackets projecting back from the rear spars. The ailerons are balanced statically and aerodynamically, and are reported to be light on controls.

The tail unit is of biplane type, the construction being of similar design to that of the main planes.

The undercarriage is of simple design, and consists of two Dunlop wheels with 60-by-12-inch tires mounted on straight axles and sprung by oleo-pneumatic shock absorbers. Palmer internal expanding brakes of large diameter are fitted to the wheels. They are operated by a pneumatic system. The control lever of the wheel brake system is centrally placed, within reach of both pilots, and is so arranged that a straight-back movement of the lever applies both brakes, while a diagonal movement to one side or other applies one or the other of the brakes.

The tail of the machine is supported by a wheel in place of the usual skid, in order to facilitate handling on the ground. An oleo-pneumatic cylinder of similar design to those used for the main wheels provides the necessary shock absorber element for the tail wheel.

The pilots' cabin is well located, providing an unrestricted view in a forward direction. Dual control is provided, the seats being situated on either side of the fuselage with a small gangway between.

The engine installation provides for the fitting of either Jupiter, Jaguar or similar types of geared engines. In order to provide adequate cooling under tropical conditions, the engines are faired off only behind the cylinders. The two lower engines are placed on the lower wings. The engine plates or bulkheads are of duralumin, built up to form boxes. These engine plates are supported by welded steel tube structures which extend aft to the rear wing spars so as to give a rigid engine mounting. From the lower engines to the fuselage the lower wings slope up to the top of the fuselage so as to avoid piercing the cabin with spars and various obstructions. The top engines, placed as close together as the propeller diameters permit, are mounted in a similar manner to the lower, but are slung under the top center section.

Provision is made for attending to the engines on the ground by suitable platforms, which are detachable. Similarly, a slinging method is provided whereby it is possible, without the use of additional shear legs, to change engines.

The fuel system is by gravity feed from four gasoline tanks situated in the top center section, which are filled from a point near the main luggage compartment, eliminating the necessity for climbing on to the upper wing.

Specifications

Span, upper wing	130 feet
Area, upper wing	1,999 square feet
Area, lower wing	990 square feet
Total wing area	2,989 square feet
Fuselage length	86 feet 6 inches
Payload	8,700 pounds
Gross weight loaded	29,500 pounds
Wing loading	9.86 pounds per sq. ft.
Power loading	15 pounds per h.p.

Performance

Max. speed at 1,000 ft.	120 miles per hour
Cruising speed at 1,000 ft.	150 miles per hr.
Landing speed	52 miles per hour
Rate of climb	600 feet per minute
Service ceiling	12,500 feet

FUEL INJECTION SYSTEM PRESSURE FLUCTUATIONS

THE tests described in N.A.C.A. Report 363, by A. M. Rothrock, were conducted at the Langley Memorial Aeronautical Laboratory, Langley Field, Virginia, to determine experimentally the instantaneous pressures at the discharge orifice of a common-rail fuel injection system in which the timing valve and cut-off valve were at some distance from the automatic fuel injection valve, and also to determine the methods by which the pressure fluctuations could be controlled.

The instantaneous pressures at the discharge orifice of a common-rail fuel injection system were determined by analyzing the stem-lift records of an automatic injection valve. The fuel injection was obtained by releasing fuel from a reservoir under high pressure by means of a cam-operated timing valve. The period of injection was controlled by the opening of a cam-operated by-pass valve which reduced the fuel pressure between the timing valve and the injection valve. An injection system of this type assures the same rate of fuel discharge regardless of engine speed. The results show that pressure wave phenomena occur between the high-pressure reservoir and the discharge orifice, but that these pressure waves can be controlled so as to be advantageous to the injection of the fuel. The results also give data applicable to the design of such an injection system for a high-speed compression-ignition engine.

Report 363 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

ADJUSTABLE ELECTRIC SCREW DRIVER

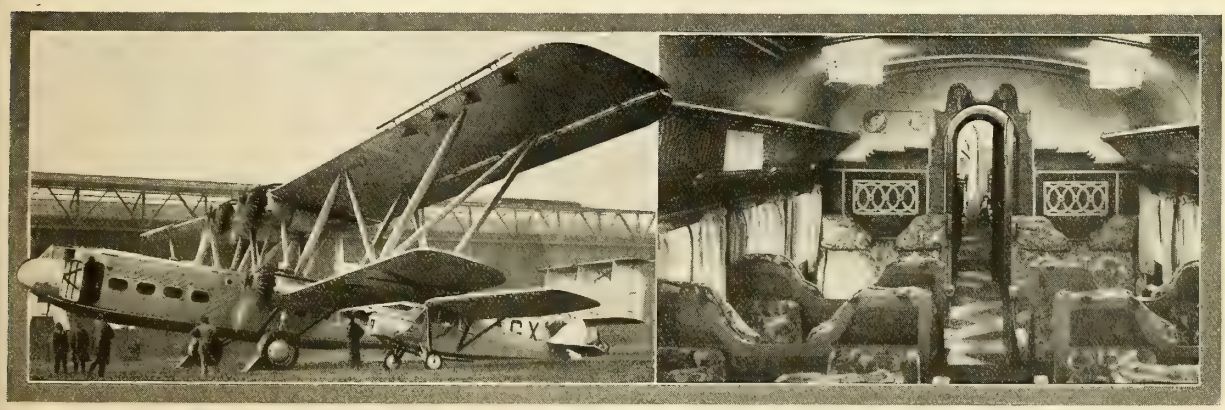
THE Black & Decker Manufacturing Company of Towson, Maryland, has announced the Black & Decker Universal Twins as part of its portable electric tool line. The Universal Twins are a 3/16-inch electric drill and a small electric screw driver.

These tools have been designed for doing tedious jobs and working in close quarters. They are short in length and the diameter of the body is small with the exterior surfaces rounded to afford easy grasp at any part.

The screw driver is equipped with an adjustable friction clutch which drives the screw "flush" and releases immediately without danger of marring the screw head or the surrounding surface. This clutch can be set to any desired tension by means of a knurled thumb screw on the gear case. When necessary, the bit can be given an additional turn by operating this conveniently located clutch control which now, with the pressure of a finger, acts as a button. The clutch can also be adjusted for driving various types and sizes of small screws and to compensate for the different conditions in driving into wood or metal.

In addition, this screw driver has the positive clutch which allows the spindle to remain idle for finding slot in screw. This positive clutch engages the bit only when pressure is exerted.

The drill is fitted with a three-jaw geared chuck of 3/16 inch capacity and has all the features found in Black & Decker electric drills of larger size. Each tool has a Universal motor with ball bearings on the armature shaft, and also on the spindle, and is equipped with a three-conductor cable and attachment plug. That can be furnished for 110, 220 or 250 volts.



Exterior and interior views of the new 40-passenger Handley Page airliner which has a span of 130 feet

FOCKE-WULF CANARD MONOPLANE

By Edwin P. A. Heinze



IN 1927, the Focke-Wulf Flugzeugbau A. G. constructed a canard type transport plane to the order of the German Aeronautical Research Institute. Unfortunately, this machine met with an accident which for several years interrupted further development of this type of aircraft. However, the work was recently taken up again and the Focke-Wulf company has now completed a second machine of the same type to the order of the same institute. Because this new plane has shown exceptional qualities in passing all official tests, it has been approved for public service.

The fuselage is a normal steel tube structure covered with fabric. The main wing is of the normal type developed by the Focke-Wulf aircraft company. It is built up of wood and covered with fabric. In the opinion of the German authorities this wing has the quality of counteracting spinning tendencies. Provided with ailerons mounted at the tips, the wing is secured in a recess on top of the rear section of the fuselage, its leading edge being about 12 feet from the point where the fuselage terminates aft. The center ot gravity of the plane is located immediately forward of the main wing.

In front of the passengers' cabin, which accommodates three persons, the fuselage sweeps down. It is there that the open cockpit of the pilot is located. Beyond the pilot's cockpit the fuselage extends to a blunt point in front. Surmounted on the forward end is the small front wing. It is mounted by means of a trussed-strut superstructure. This wing is practically triangular in form, with the straight base line of the triangle as leading edge. The angle of incidence of this wing is considerably greater than that of the main wing. Inasmuch as the trailing edges meet at an obtuse angle, two separate elevator surfaces are used. These are attached by means of brackets in such a way that their front edges fit into recesses in the lower surface of the wing and leave a slot between. The elevators are balanced by the turning axis being retracted from the front edges. This, incidentally, causes the air slots to become narrower when the elevators are depressed for climbing and larger when lifted for descending.

Two 100-horsepower Siemens-Halske engines are mounted on nacelles fixed to the main wing right and left of the cabin. These engines drive tractor propellers. Behind the fire wall of the engines and inside the nacelles are the rubber ring shock absorbers of the landing gear struts, which come up vertically from the divided axles on which the wheels are mounted underneath the main wing. The nacelles also carry the oil tanks. The fuel tanks are located in the main wing on either side of the cabin.

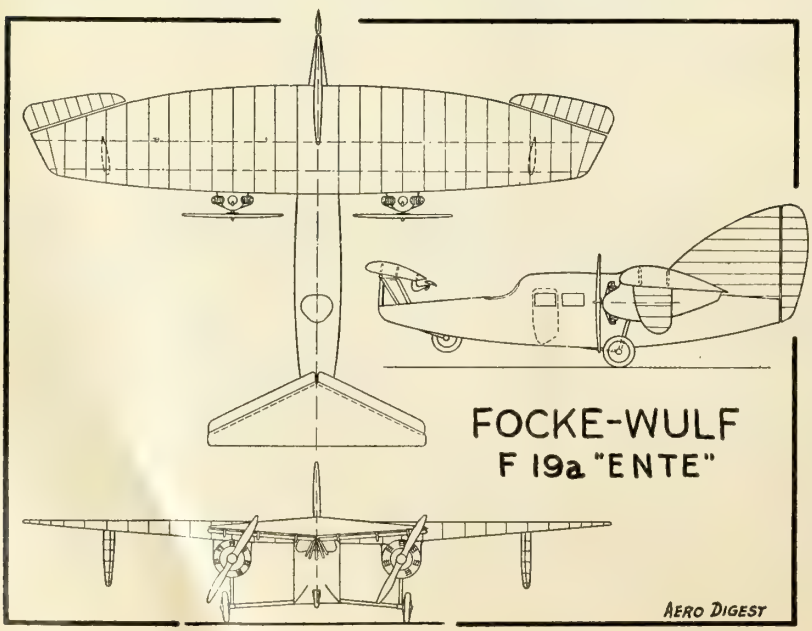
The main fin is exceptionally large, extending half way up the main wing. The reason for this unusual size is that the horizontal turning axis of the machine lies just forward of the main wing, thus giving but little leverage to this control, a condition which must be compensated by size. The rudder is relatively narrow, but high. In addition to the large main fin, two other fins are mounted beneath the main wing, one on each side, between the wing tip and the engine. These fins, which also are comparatively large, hang vertically from the lower wing surface and are supported on both sides by cables. The planes of the fins are set at a small angle to the longitudinal axis of the machine.

All controls are operated by cables running over pulleys. The arrangement of the controls is entirely orthodox. On the ground, the forward end of the machine is supported by a wheel recessed into the lower surface beneath the front wing. The wheel is equipped with a rubber ring shock absorber.

The development of this plane has been supported by many leading scientists in Germany who hold that the canard principle has a great future. Beside the Focke-Wulf company, the building of the plane was sponsored by the German Aeronautical Research Institute, and the technical colleges of Göttingen and Aix-la-Chapelle did all in their power to assist. At Göttingen wind tunnel tests on the design were conducted over a period of several months to the exclusion of other important work, and it is a fine testimony to the efficiency of modern theoretical research methods that the plane measured up to—in fact, far exceeded—the calculated performances.

It would seem that the several advantages claimed for the canard type of plane deserve more attention on the part of airplane designers than they have hitherto received. Theoretically, it is impossible to stall such a machine, since the front wing has a large angle of incidence which causes it to reach the burbling point always much sooner than the main wing. When the forward wing stalls it loses its lift and tends to drop, thus reducing the angle of the main wing and making it impossible for it ever to reach the stalling angle. Secondly, be-

(*Continued on following page*)





BLAZING THE TRAILS OF THE AIR

WHEN aircraft routes must march out ahead of flying base development and depend largely upon unimproved landing fields, Aerol Oleo-Pneumatic Struts are almost invariably called upon to reduce landing and take-off hazards.

Typical of this service to flying is the experience of the Wien Alaska Airways, Inc., operating Hamilton Metalplanes along the Siberian Coast. Mr. Noel Wien, President, writes:

"Many of the landing places on our routes are very rough, due to lack of men, money and building facilities. We are forced to land in some of the toughest looking places imaginable, and I want to say that our Aerol Struts have been a big factor in safety and protection of the ships from a maintenance standpoint."

Aerol Struts are equally effective on wheel or ski-equipped ships. Their air-and-oil principle of shock absorption affords a margin of safety and maintenance economy not obtainable with any other type of strut.

Aerol Struts are manufactured by The Cleveland Pneumatic Tool Company, Cleveland, Ohio. The engineering department of this company is at the disposal of any interested aircraft designer.

MORE IN USE THAN ANY OTHER MAKE

AEROL *shock absorbing* STRUT

(*Continued from preceding page*)

cause the front supporting wheel is situated more than thirteen feet in front of the center of gravity, it is practically impossible for the machine to nose over. This involves the further advantage that the wheel brakes may be applied, if need be, with full force as soon as the machine lands. With the engines mounted under the wing and with no heavy part behind the cabin, the danger to the passengers is diminished. In a bi-motored machine such as the Focke-Wulf some of the power lost as the result of eddies created by the front wing can be regained by arranging the propellers to take advantage of the vortices set up in a reverse direction, so that the propeller blast is practically without any rotary movement. The propellers may also be located at the trailing edge of the main wing. This was not done by the Focke-Wulf makers because they felt the problem of providing connecting shafts between engines and propellers, which would have to be used in this case, has not yet been solved satisfactorily, and they did not believe it worth while to engage in further experiments along this line.



The Focke-Wulf canard in flight

Span, main wing	46 feet
Span, forward wing	16.4 feet
Area, main wing	317.5 square feet
Area, forward wing	64.6 square feet
Length	34.5 feet
Weight empty	2,585 pounds
Disposable load	1,045 pounds
Gross weight	3,630 pounds
High speed	89 miles per hour
Cruising speed	79 miles per hour
Landing speed	52 miles per hour
Climb to 3,280 feet	8½ minutes

New Stromberg-Carlson Aircraft Radio Receiver

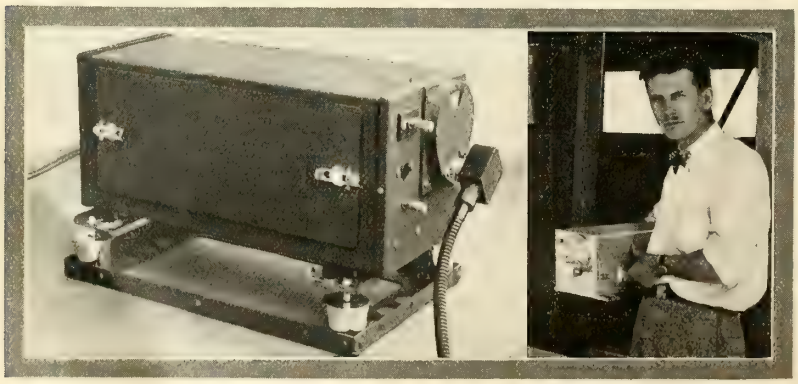
A NEW type of aircraft radio receiver, known as Model D, has been introduced by the Stromberg-Carlson Telephone Company, Rochester, N. Y. The company will manufacture this unit following specifications developed by Aircraft Radio Corporation, Boonton, N. J., pioneer in aircraft radio receiving apparatus. The most interesting feature of the receiver is that it is universal as to frequency band and class of service. The Model D covers the upper frequencies or communication bands, the entertainment broadcast frequencies, and the lower frequency aircraft radio beacon and weather broadcast band.

A frequency range of from 250 to 15,000 kilocycles is covered by the new model, through the use of a removable coil assembly. The receiver proper measures 15 by 7½ by 6½ inches. The weight with tubes and shock mounting is 18 pounds. The receiver may be operated from dynamotor or dry battery plate supply; filaments of the tubes are heated from the 12-volt airplane battery.

The receiver employs four screen grid type 224 heater tubes and one type 227.

In the circuit design care has been taken to provide good signal to noise ratio, so that the receiver is particularly quiet in operation. Four tuned circuits insure adequate selectivity for the increasing congestion of aircraft radio channels in the United States. Model D is sufficiently sensitive for use with small "built-on" antennas. It will operate satisfactorily with an antenna exposure as small as two feet above the fuselage.

A remote tuning control having a number of novel features is furnished with the receiver, since the space limitations on most aircraft require that the receiver be located in the rear part of the fuselage away from the pilot or operator.



Stromberg-Carlson Model D aircraft radio receiver with remote tuning control

HEINKEL PLANE ON THE S. S. EUROPA

BY RICHARD M. MOCK

Ernst Heinkel Flugzeugwerke

LIKE the fast transatlantic steamer *Bremen,* its sistership, the *Europa,* is now equipped with a catapult and airplane. All of the aeronautical equipment on both ships was developed and built by the Ernst Heinkel Flugzeugwerke G. M. B. H., Warnermünde (Germany), especially for this service.

The installation made a year ago on the *Bremen* was operated successfully until the winter weather necessitated suspending the service. In the spring the service was re-established and now is being supplemented by a similar service on the S. S. *Europa.*

The practice that has been followed has been to have the airplane leave the steamer one day before the latter reaches port and thus expedite the arrival of the mail at its destination much ahead of time that would be required if it stayed with the boat until it docked at its destination. By means of the airplane it is possible for a letter to be delivered in Europe four days after having been posted in America.

The installation is operated by the Luft Hansa in coöperation with the North German Lloyd and the German Post Office Department.

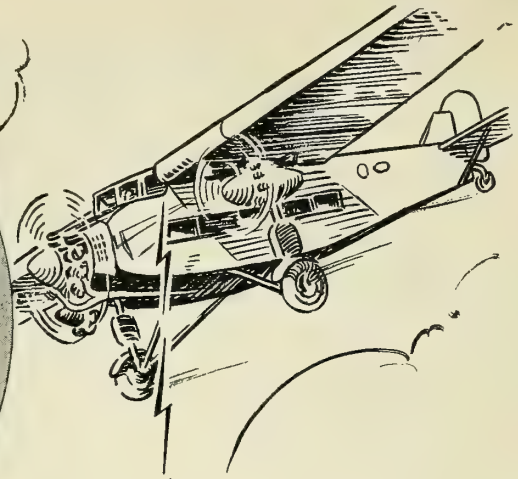
The catapult on the *Europa* is similar to that on the *Bremen,* being mounted on the top deck between the two funnels. It operates on a turntable so that it can be directed against the wind without stopping the steamer.

Since the catapult installation on the *Europa* is somewhat newer, it is naturally somewhat improved. The airplane used on this catapult is similar to that on the *Bremen,* being a low-wing twin-float seaplane powered with a Pratt and Whitney Hornet engine. The main difference between the *Europa* plane and that of the *Bremen* is that it has a higher payload and the pilot and radio operators are seated side by side rather than in tandem. The *Europa* plane, the Heinkel H.E. 58, is primarily a long-range seaplane, carrying full equipment for use at open sea. Besides the usual aeronautical equipment, it is fitted with sea equipment and radio antenna mast for use in case of a forced landing at sea. The fuselage and wing bracing are of welded steel tubing. The wings are of wooden construction covered with fabric; the fuselage and tail are of steel also fabric covered.

The Hornet engine is fitted with a Hamilton-Standard propeller. The wings are supported from the twin floats in a manner similar to the conventional Heinkel design. The inter-float bracing is reinforced by additional struts to take the catapult forces.

With two men, complete equipment (including radio) and 485 pounds of mail, the plane has a range of about 1,250 miles. The weight is 3,960 pounds empty and 6,685 pounds fully loaded.





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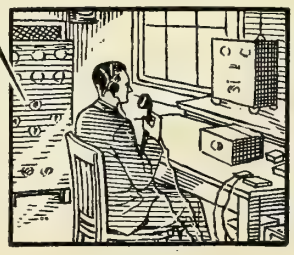
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DEEBLE DUPLEX ENGINE

By NED FRENCH

INITIAL tests of the first aviation type Deeble Duplex engine will be conducted at Long Beach, California, this month with representatives of one of the largest airplane and engine manufacturers observing the first public demonstration.

The Deeble Duplex is another effort to apply the double principle used in the steam engine cylinder to internal combustion engines and appears to be perhaps one of the most practical applications conceived to date.

Although the problem has been attacked in various ways in the past, most previous efforts have been characterized by the use of crossheads, long connecting rods and other apparatus which, aside from their complexity, have blocked the way to success, so far as aircraft use is concerned, because of their excessive weight.

The Deeble Duplex engine has been in experimental operation for more than a year. The first experimental engine was a twin-cylinder motorcycle engine, remodeled. With an output of 25 horsepower, it has operated line shafting and all the equipment of a good-sized machine shop for more than 500 hours without failure to function properly at any time during that period.

Tests this month will be conducted with a six-cylinder inverted in-line air-cooled engine calculated to deliver 300 horsepower at 2,000 revolutions per minute. It has a bore of 4.5 inches and a stroke of 5.0 inches. The engine weighs 550 pounds complete with generator, electric starter and General Electric gear-driven supercharger, which is calculated to maintain a static pressure of four pounds to the square inch above atmospheric pressure.

The main feature of the engine is the application of the double-acting principle. This is accomplished by employing a double piston—a piston within a piston, the inner piston being stationary and being designated a "bulkhead" by the designer.

For purposes of describing the action of the engine, although it is an inverted type, we shall refer to the action of the piston as though it operated in right-side-up position in order to avoid confusion in using the terms "above" and "below," etc.

The inner piston, or bulkhead, is made fast to the cylinder wall at the lower edge of its skirt. Both sides of its skirt are slotted to allow the wrist-pin of the moving piston to travel up and down. Just above the head of this fixed piston or bulkhead, the cylinder is fitted with a valve chamber. As the moving piston makes the upward stroke, gasoline vapor is drawn into the space beneath its head through this auxiliary, bottom-end valve chamber, located at the bottom end of piston travel, but in reality, about midway in the cylinder between head and crankcase.

This "under-side" gas charge is provided entrance to the combustion space beneath the traveling piston-head via a wide gap in the piston skirt which is cut away for one-fourth of the total distance around the piston. A sectional piston ring closes this gap and prevents gas from blowing by the bulkhead into the crankcase. The ordinary piston rings on the movable piston prevent the gas from making its way to the upper combustion chamber.

The upper combustion chamber operates in the usual manner. Both regular and auxiliary combustion chambers are of L-head design. Pistons are of nitralloy steel and, though somewhat longer than the conventional piston, are not as heavy as would seem apparent from the description. They weigh approximately 50 per cent. more than the conventional piston for the same bore cylinder. Entire cylinder, bulkhead, piston and connecting-rod assembly of the present engine weighs 51 pounds. Cylinders are nitralloy steel with machined cooling fins. Cylinder heads and auxiliary heads, or valve-chambers for the under side, are aluminum and the crankcase is aluminum. Piston heads are hollow and are salt-cooled. No difficulty with cooling has been experienced in the small experimental engine.

One camshaft is provided for each set of valves, top-side and auxiliary. Camshafts are set on opposite sides of the crankshaft, which is provided with seven main bearings. A gear pump provides pressure feed to all bearings and is so designed that there are no outside oil lines.

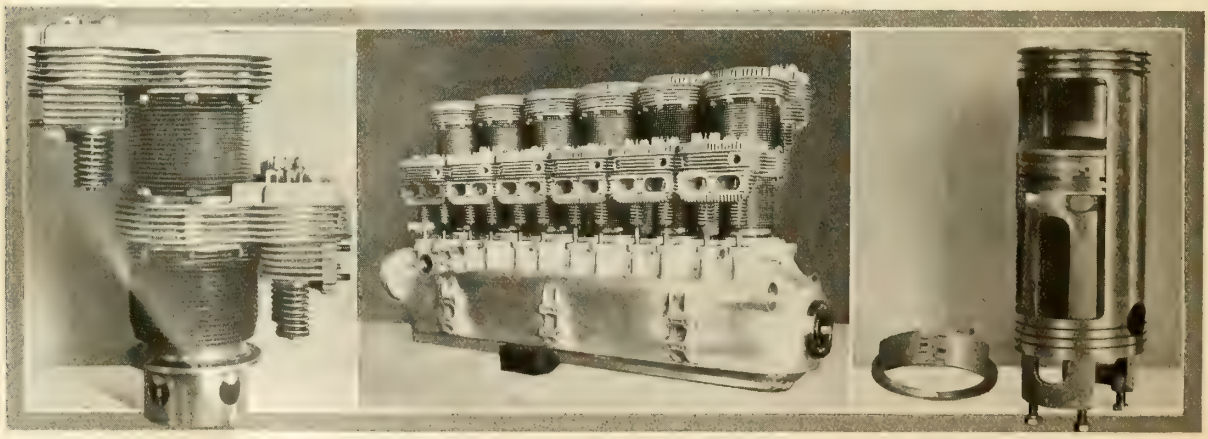
A unique design feature is that one cam-follower to each cylinder functions as an oil scavenging pump to assure circulation of oil which finds its way to the crankcase side of the stationary pistons or bulkheads.

Roy Deeble, Long Beach real estate operator and capitalist, is the inventer of the engine, and J. O. York, aeronautical engineer, is the designer.

The designer selected an inverted in-line type for the first large size model because of advantages of small frontal area, increased visibility and what he believes will be greater durability, although the radial design would have enabled him to produce an engine of more advantageous power-weight ratio in comparison with present types.

Total piston displacement of the 300-horsepower model is 927 cubic inches. Dimensions of the upper combustion chamber are 4½ by 5 and of the lower 4 5-16 by 5. Compression ratio in the upper chamber is 4.75 to 1 and in the lower 5 to 1. Volume of the lower chamber is 94 per cent. that of the upper, and the difference in compression ratios is calculated to cause the energy imparted to the crankshaft to be the same from both upper and lower explosions despite the disparity in volume of gas burned.

In addition to delivering more power for a given weight in comparison with other four-cycle engines, the experimental engine has shown vastly increased acceleration ability, improved fuel consumption and comparative freedom from vibration.



Cylinder unit, general assembly and piston of the Deeble Duplex engine designed to be installed in inverted position

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The Heath Parasol is easily convertible to a twin-float seaplane or a conventional landplane

THE 1931 TYPE HEATH PARASOL

THE new 1931 Heath Parasol, which won the 110-cubic-inch closed course event at the recent National Air Races, is an improvement both in appearance and performance over the older model. The new Parasol carries a single graceful curve which not only adds to its attractiveness, but also increases the speed. To provide easier entrance to the cockpit a door has been incorporated in the left side of the fuselage and the flying struts are joined at the bottom. The latter alteration eliminates four drift cables and allows the aileron cables to be run through the forward struts.

There is a skylight set into the wing above the cockpit, permitting vision above the plane as well as a view of the gasoline gauge in the wing tanks. Another new feature is the demountable wing. For either transportation or storage both wing panels can be hung in stirrups alongside the fuselage by removing six bolts and drawing two pins in the aileron cable and two pins in the drift wires. The operation requires approximately twenty minutes, and the airplane can then be stored in a space no larger than that required for an automobile. The reassembling of the ship for flight is equally simple. No rigging or adjustments are necessary, since the entire operation consists of slipping in the bolts and pins, and securing them.

These refinements are reflected in the plane's improved performance. Whereas the old model had a top speed of 70 miles per hour and a cruising speed of 56 miles per hour, the new model has a top speed of 85 miles per hour and an optimum cruising speed of 66. Despite the increase in speed, according to the Heath company, the fuel consumption has not been increased because the improved speed is the result of the altered design.

The landing speed of the 1931 model is 28 miles per hour, and the plane takes off in four seconds, has a ceiling of 16,000 feet and a cruising radius of 400 miles on 10 gallons of gas (two tanks). The airplane has a safety factor of seven.

Change from wheels to floats or vice versa can be effected in a short time, since the pontoons and skis are attached to the same fittings employed to hold the regular landing gear. The airplane equipped with pontoons takes off from the water in eight seconds and climbs at the rate of 450 feet per minute. The floats are of the conventional type with a step bottom and air feed pipes to break the water seal when taking off.

The factory-built 1931 Heath Parasol has an all-steel, welded fuselage with welded steel ailerons and tail assembly. Construction is of the Warren truss type. The wings are constructed of airplane spruce with solid spars and fabric cover. The ribs are built by a special process using no nails. The ribs, too, are of the Warren truss type and weigh only two and three-quarters ounces each.

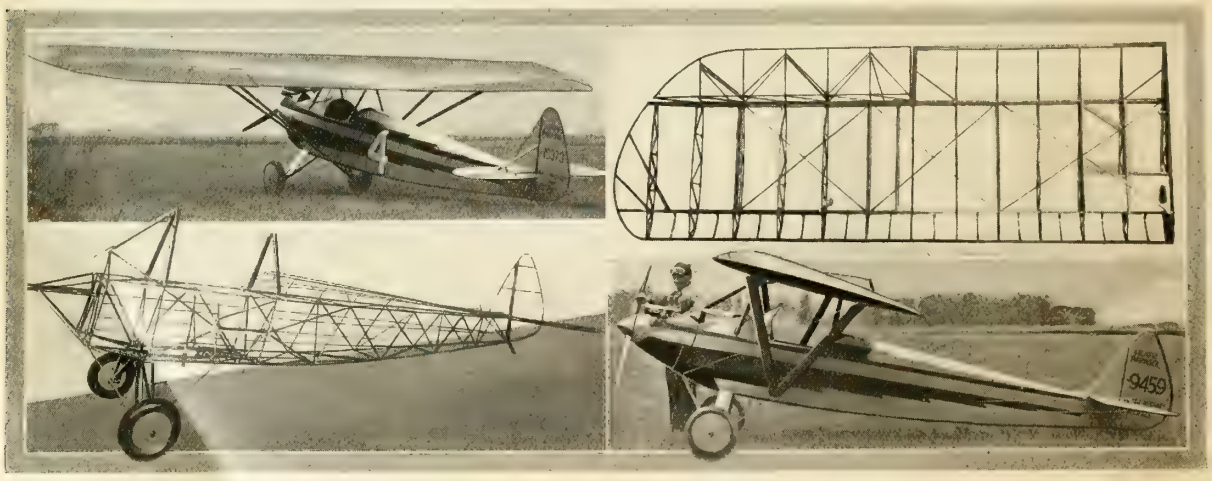
The plane can be converted into a low-wing job by fastening the Parasol wings to the lower longeron. The flying struts of the standard Parasol run from the center pylon just over the fuselage to the upper surface of the wing. The tread of the landing gear has been widened. Although the low-wing arrangement is not as stable as the Parasol type, it has a three per cent lower landing speed.

Another variation is the big wing Parasol which has been developed for higher altitude flying and heavier loads. This plane has a wing area of 127 square feet, with a tapered wing section and tapered wing tip. The ship has a useful load of 350 pounds and a landing speed of 25 miles per hour.

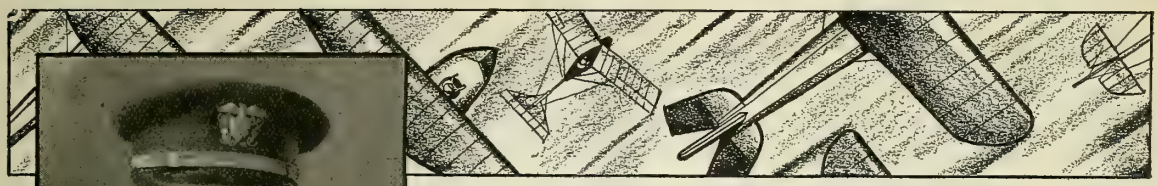
Heath wheel brakes are optional. An all-metal propeller is also available in place of the standard hardwood propeller.

Several improvements have also been made on the Heath aircraft motor, the four-cylinder in-line air-cooled engine with which the Parasol is powered. In

(*Continued on following page*)



Details of the Heath Parasol monoplane showing the tubular steel fuselage construction, the skeleton framework of one of the wing panels, and the new V-type flying struts which eliminate drift braces





LIEUT. RALPH S. BARNABY

In 1911, Lieut. Barnaby qualified for the Early Birds Association by his self-instructed gliding flights. In August, 1929, he soared for 15 minutes and 6 seconds at South Wellfleet, Mass., thus becoming the first person in this country to qualify as a first-class glider pilot. For this flight, he received from the National Aeronautic Association (F.A.I.), First-Class Glider Pilot Certificate No. 1. It was Lieut. Barnaby in January of this year, who launched his glider from the airship Los Angeles in flight over Lakehurst, reaching the landing field 3,000 feet below over 12 minutes later.

Lieut. Barnaby's official duties as Chief of the Specifications Group, Scientific Section, Bureau of Aeronautics, U. S. Navy, are an indication of his ability to give expert help on construction details, materials, etc., etc.

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Among the topics covered at length are: handling and dismantling an airplane; stresses and strains; sequence of rigging steps; truing up the fuselage, the center section, and the wings; adjusting the angles of incidence and dihedral; overall adjustments; spars and struts; splicing and fitting; controls and adjustments for instability; practical hints for riggers; inspection; installing and correction of compasses; etc., etc. In addition to telling all about rigging, the authors have collected and arranged a mass of information about fabric, wood and glue, metal parts, wire, dopes and doping, and parachutes.

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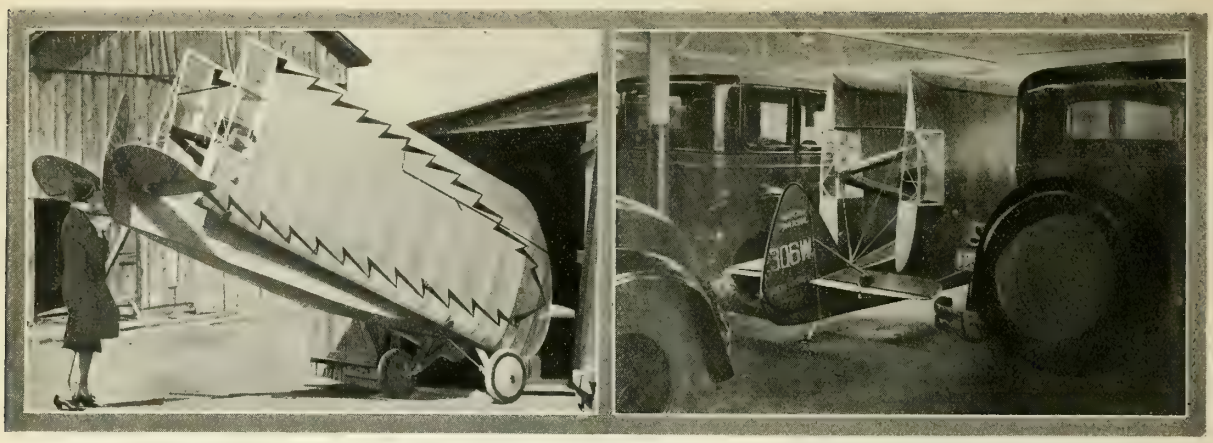
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A country barn serves as a hangar for the Heath Parasol; in the city, a public garage provides suitable storage space

(*Continued from preceding page*)

the new engine vibrations have been reduced by balanced pistons, rods and crankshaft. Sticking valves are eliminated by the use of special bronze valve and tappet guides. To forestall bearing trouble, the engine uses closed type rod and main bearings with an oil pressure of more than 100 pounds. The shape of the sump is such as to assure delivery of oil at any angle of climb or dive. The valve areas are kept cool both by tall finned port plugs and by increased diameter of the valve stems and the section around the exhaust valves. The rear cylinders, which are shielded by their position, are cooled by means of a carefully engineered cowling. With a newly designed cylinder, this motor delivers 30 horsepower at 3,000 revolutions per minute.

THE GEE-BEE SPORTSTER

THE Gee-Bee Sportster is a low-wing, single-place, open-cockpit monoplane developed by Granville Brothers Aircraft, Inc., of Springfield, Mass. The ship is powered with an inverted supercharged Cirrus engine developing 110 horsepower at 2,100 revolutions per minute, and is fitted with a special gas system for inverted flying which automatically feeds gasoline to the carburetor when the ship is in any abnormal attitude of flight.

The Gee-Bee Sportster is well streamlined throughout. The fuselage is oval in cross-section and clean in design. The wings, which taper towards the tips, are in two sections and attached to the wing stubs which are integral with the fuselage. Fairing is used at the point where the wing stubs extend from the fuselage proper.

The wings are braced directly to the landing gear which is of the divided type, consisting of two independent units each comprised of two V-struts. Landing loads are carried to the fuselage by two parallel oblique struts which extend to the upper fuselage longerons from the upper surface of the wing at points directly above those at which the landing gear struts terminate on the under side. Streamlined bracing wires extend from the wheel axles to the under side of the wing. The landing gear is further braced by two cross wires between the units, each extending from the axle to the wing. Twenty-by-nine-inch Airwheels provide shock absorption. A tail skid is provided. The wings are braced to the fuselage by two struts, as mentioned, and two streamlined wires on each side. All exposed attachment points of wires and struts are well faired to reduce resistance as much as possible. The cowling and the top of the fuselage as far back as the cockpit are of metal. The rest of the ship is fabric covered and finished with Berryloid dope.

The openings of the cockpit are cut deep into the sides of the fuselage to facilitate entrance and exit. An ample sized windshield and a headrest are provided. Space sufficient for tools and a large brief-case is provided under the turtle deck. The exhaust stacks of the engine are so arranged as to carry engine fumes under the fuselage and away from the pilot. The ship is equipped with a Hamilton-Standard metal propeller.

The stabilizer is rigidly braced to the fuselage and the fin by four wires. A Bungee control provides longitudinal balance adjustment. The fin is faired into the fuselage. The rudder is unbalanced.

Gee-Bee Sportster Specifications

Span	25 feet
Length overall	16 feet 5 inches
Wing area	85 square feet
Weight empty	750 pounds
Fuel capacity	38 gallons
High speed	146 miles per hour
Cruising speed	120 miles per hour
Landing speed	49 miles per hour
Initial climb	1,400 feet per minute
Climb to 5,000 feet	5.5 minutes
Cruising radius	520 miles

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CONSTRUCTION of a radial air-cooled engine which develops 800-horsepower has been completed by Armstrong-Siddeley Motors, Coventry. The engine is called the "Leopard." Radiating from a central crankshaft there are 14 cylinders which are arranged in two banks each of seven cylinders, staggered one behind the other.



Granville Brothers single-place "Gee-Bee" Sportster with inverted supercharged 110-horsepower Cirrus engine

Ruth Nichols *flies from* Los Angeles *to* New York *in* 13 hrs. 21 mins. 43 sec. *using*



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This betters every transcontinental record except that of one man --Captain Hawks--and this young society girl pilot was within 54 minutes of his time. On the second lap of her trip from Wichita to New York--she beat Hawks' time by 17 seconds! The best previous record made by a woman was bettered by many hours.

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PERSONAIRLITIES



THE heading of this PersonAIRlities page has long been a source of pain to me. I didn't like the big, black letters and I didn't like that picture of myself staring out at me every month. Not that it didn't look like me—unfortunately, it did. That was my only objection to it. My friend, Bill Heaslip, America's foremost aviation artist, executed it—and trust a friend to tell the truth about you! I thanked him for doing it, and used it because it was a gift from him—but I always resented it. I think to this day that he could have idealized me a trifle; after all, the double chin *might* have been smoothed over.

Thanks to a strenuous summer by the sea, the double chin and twenty pounds of fat vanished, apparently into the ocean—and I ceased to resemble Paul Whiteman or even that too candid picture. When I visited Bill recently he commented on my changed appearance—which he attributed, not to healthful exercise, but to starvation following the market collapse—and said that it was time to do another heading for this department. As we chatted, he sketched rapidly, and next day presented me with the splendidly decorative design that appears above.

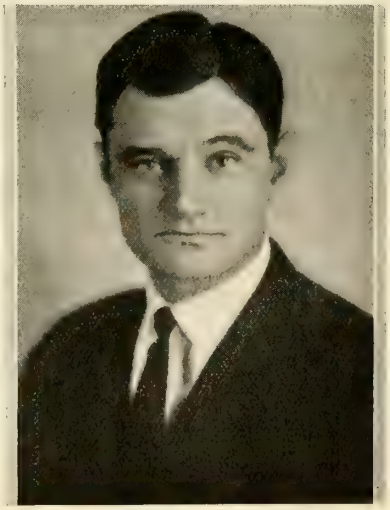
I hope you like it and are content to see it each month while this department and I survive—for I think you're going to get it whether you like it or not. If I grow more beautiful—which is hardly likely—we'll change the silhouette; but the rest of it I feel is perfect. I'm delighted with it, and sincerely thank Bill Heaslip for turning me out with all the dignity of the American Indian who adorns our nickel.

CHARLES W. (SPEED) HOLMAN was nearly a Christmas present: he was donated to the Holman family on December 27, 1898, in Minneapolis, Minnesota. In early life this birthday undoubtedly was a handicap to him, for naturally there's no excuse for giving a boy a birthday present when he's had his Christmas presents only two days before. My own birthday is early in January, and I recall that its nearness to Christmas worked very much to my disadvantage when I was a youngster—I never did half so well on my birthdays as my brother and sister did on theirs. Now I don't get even a Christmas present unless I buy it myself.

"Speed" has always been something of a mystery to me: I know him as the sane and conservative operations manager of Northwest Airways, Inc., and also as one of the wildest and boldest stunt pilots I have ever watched. To find him one or the other would be natural, but to find him a combination of both is somewhat staggering, until I delve into his past history. Then I learn what made him what he is—wing-walking in his youth. Speed can look at the wings of an airplane and croon, "You made me what I am today—I hope you're sat-iss-fide."

It seems that back in 1920 there was some parental opposition to his becoming a bold airman, so Speed went into wing-walking and parachute jumping, hoping eventually to become a pilot. Milton Girton, now one of the most conservative pilots in the business, started the same way. Speed had tried to get into the Army during the war, but had been unable to pass the physical examination. There was no examination for wing-walkers. All they needed was a firm hold, and Speed had that. He had built up a strong grip by handling tools as a mechanic for Walter Bullock, a pioneer Minnesota flier, so he used that grip on various airplanes during 1920.

His father, either convinced that Speed was determined to become a pilot or afraid that he might let go at the wrong moment while wing-walking, bought him a Jenny on the condition that he devote himself solely to flying it, and refrain from wandering around over it while it was in the air. So here was one case where a father actually bought his son an airplane in the interests of safety, though after watching Speed do some outside loops and other trifles I don't believe that the ultimate in safety was attained by that purchase. Mr. Holman should have bought his son a submarine or a canal boat—but then we'd probably have heard of Speed doing slow rolls in a submarine. It's all the fault of that early wing-walking, which is very unsettling stuff.



Charles W. (Speed) Holman

Speed had bad luck with that plane. While starting the motor one day, he permitted a student to handle the switch, with the not surprising result that the student the ship, and a tree got together and presented Speed with a whole winter's work repairing the craft and restoring his father's shaken faith in aviation. In the spring of 1921 he took to the air again, flying for himself, and in 1922 and '23 acting as chief pilot for the Security Aircraft Company and the Rhodes School of Aviation. The following year he was in charge of exhibitions for the St. Paul Dispatch Flying Circus, and won second place in the "On-to-Dayton" race from Minot, North Dakota. It was at Dayton, in 1925, that I met him. Saw him again at Chicago races in 1930, and he hasn't changed a bit. Of course, I've run across him here and there during the last five years, and he's always the same—same look, same accent, same weight, same height. He's worn better than most of us. Despite his stunting, I think he'll last forever, the whole seven feet or so of him. We'll eventually have to tear him down and erect an office building instead.

In the fall of 1926 he became an air mail pilot for the Northwest Airways, Inc., of which the kindly and able Col. L. H. Brittin is vice president and general manager. Speed set speed records between St. Paul and Chicago several times, the fastest being one hour and forty-eight minutes for the 360 miles—no record being made by the plane headed the other way. By the way, when I hear of these eastbound air mail records I'm always curious to know what the westbound plane made it in. No mention is ever made of the favoring wind—or gale. Clever people, these aviators!

Speed became operations manager for Northwest in the fall of 1927, and still holds the job, which in itself is pretty nearly an aviation record. But not content with that, he set a record for consecutive loops at the St. Paul airport, turning over 1,093 times. A few days later some Frenchman did 1,111, which so infuriated Speed's old wing-walking complex that he went up and did 1,433,

(*Continued on next page*)

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(PersonAIRlities continued)

thus advancing American aviation by just that much. He's done a lot of racing, too. In 1927 he won the National Air Derby, New York to Spokane, in nineteen hours, forty-two minutes, for a prize of $10,000. He won the Spokane-to-Portland race twenty-seven seconds ahead of Eddie Ballough. The Los Angeles to Cincinnati Air Derby in 1928 found him the winner of $2,500. And in 1929 he won the Gardner Trophy race from St. Louis to Indianapolis and return, taking a prize of $6,250 and a cup. In the same year he won a race at Cleveland; and in 1930 we see him coming in first at Chicago in the Thompson Trophy race in a Wasp Junior Laird at a speed of 201.91 miles per hour. He has probably won a few other races here and there, but that's all I know of. Off-hand, I should say that speed has paid Speed some $30,000. When that news gets to be generally known, there will be an increase in the enrollments for aviation correspondence school courses.

Now, in my opinion—which is not put forth as being the last word in wisdom, but simply as my personal opinion—ninety-five per cent of Speed's flying has been useful and constructive, not only his air mail work but all of his racing. I don't believe in stunts at all, however. Writing Speed last June I said: "Pilots like yourself, Freddie Lund, Al Williams, and Jimmy Doolittle perform stunts safely because you have specialized in them. But the average young pilot coming along, who doesn't know a thing about it, tries to emulate you and the other expert stunt men, and comes to grief."

Speed is a recognized and famous stunt pilot, who has had more practice and has more skill at stunting than ninety-nine out of a hundred of the rest of us, and yet in reply he stated his recovery from some tight spots could be attributed to nothing more definite than good luck. He simply had good luck—aided, of course, by a skill that has become almost subconscious with him—and he had come out all right. Dozens of young pilots—and old ones too, for that matter—haven't come out all right. Their skill or their luck deserted them, as the newspapers informed us on various occasions this past year. I wish that any young pilot who is straining himself to become a famed stunter would take Speed's word on the part luck plays and ask himself if it's worth while doing a form of flying that depends for its success so much on a fickle factor. If he has no great concern for his own survival, will he be considerate enough to remember that the fewer of us who die in airplanes the greater chance will commercial aviation have, not only for surviving, but actually for going ahead and enabling those in it to prosper? The success of aviation, I would remind them, will not be built on a foundation of crashes.

Speed Holman has enjoyed a singularly successful career in aviation, and today fills a position of trust, capably directing the operations of a large air line. His success I attribute to his common sense, to his determination, and to hard work. I attribute not a particle of it to his 1,433 loops or even to the distressing fact that he was the first pilot ever to make an outside loop in a commercial plane. I simply blame that on his early wing-walking proclivities, which I hope he eventually outgrows. We do outgrow things, you know. For instance, I was raised on a bottle—and only weaned myself last April.

IF the ghost of the old Air Mail Pilots of America ever wafts itself into the office of Carl Egge, executive secretary of the National Air Pilots' Association, and takes a look at the membership list, that ghost of the old association will emit a ghastly moan and disappear in a cloud of face powder. For on the list will appear the name of Chubbie Miller, alias J. M. Keith-Miller, alias Mrs. Keith-Miller—an appearance that couldn't have been possible under the old regime when only big, strong, bold men could be members. The big, strong, bold men, however, have been battered into submission, and our noble association, once sacred to the heavy tread of the male, now resounds to the click of French heels.

Old air mail pilots, hearing this ominous sound, shudder at the thought that man's



Mrs. J. M. (Chubbie) Keith-Miller

domination of the field of adventure and high endeavor is threatened. But they can't do anything about it. Whether they like it or not, the girls are in aviation to stay; and more arrive every year. They've read the ad, "Do You Crave Adventure, Popularity, Big Pay?" And they've answered, "Yes, indeed." The old theory that woman was too fine, too tender, too frail to indulge in the rougher pastimes was not invented by women; it was invented by men, who naturally preferred that women should stay home and do the cooking. This lasted until the production of canned foods, when some high-spirited woman thrust a can-opener into her husband's hand and walked out on him. He's been opening cans and groaning about it ever since.

Which returns us to Mrs. Keith-Miller, leaving Mr. Keith-Miller with an Australian can-opener in his hand, and starting out into the world to see for herself what it was all about. Bidding good-bye, then, to that pathetic figure who stood with a can of beans in one hand and the opener in the other, and a puzzled, hurt look on his face, we trip along with Chubbie and take a glance at the world of aviation as she found it.

"Until 1927," she writes me, "my life was quite uneventful. I did the usual things that other children do. Went to school, got married, and then got restless." Thus briefly does the lady dismiss the holy state of matrimony! It was uneventful, and she got restless. In fact, when she states that she did "the usual things that other children do"—went to school and got married—I take it that she looks upon marriage as a rather childish exploit. In which, I submit, she isn't far from the truth. However——

"I decided to see the world. Managed to get a job selling motor cars, and in six months had saved enough money to travel for six months. I only wish the public would buy aeroplanes with the same rapidity.

"Well, I sailed for England and shortly after my arrival I met a cheerful sort of madman called Bill Lancaster. He informed me that he was going to fly to Australia in a light aeroplane. It sounded all right, but the only snag seemed to be that he hadn't got the aeroplane. This was rather awkward, as the manufacturer insisted on cash before delivery. Bill was all set to go, complete with maps and passports, but the aeroplane seemed to be necessary.

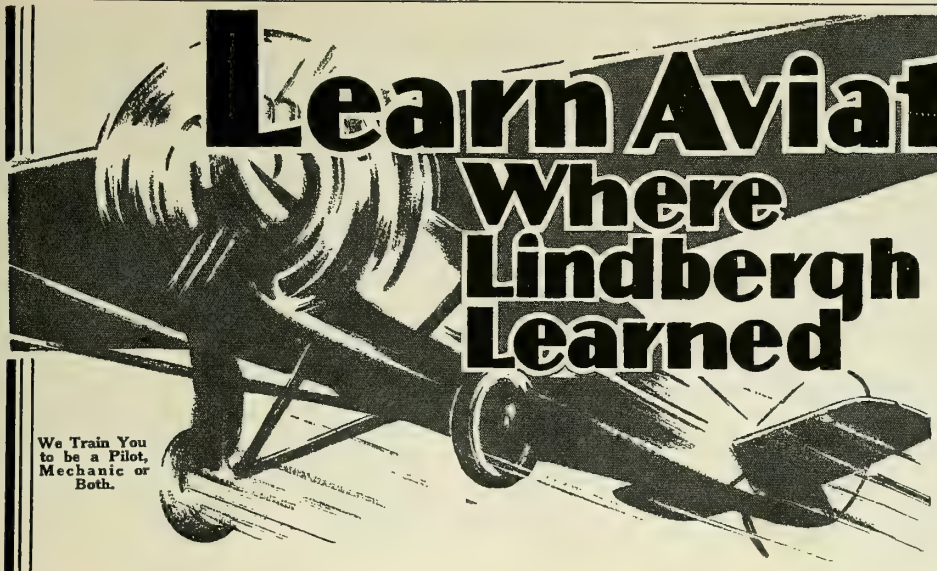
"This was where I came in. I agreed to use the proceeds of my car-selling in Australia, and pay for half the ship on condition I went too. Mind you, I quite agree that this was taking a mean advantage of Bill, but he eventually agreed, and we started off. We left England with $100 between us, and it seemed an awful long way to Australia."

Yes, 13,000 miles is quite a distance to travel in an Avro Avian powered with a Cirrus Mark II engine and one hundred dollars. It would take two people like Chubbie and Bill Lancaster to attempt it—and get away with it. I don't know how they managed it, for she doesn't say whether they ever had more than a hundred or not. I presume they had, for, says Chubbie, "We had various adventures, the worst one being a crash on the take-off at Muntok in the Dutch East Indies. The engine got tired and refused to go any farther, so we came down rather suddenly wrong side up. We shipped her back to Singapore, cabled for spares, and patched her up."

Now then, Mrs. Chubbie, how did you do all that on $100, including gas and oil all the way, living expenses en route, and while waiting for spares to come by boat? Also, they left Croydon in October, and landed at Port Darwin, Australia, on March 20. Someone must have come to the rescue—perhaps the plane or engine manufacturers, or—well, did the poor old chap whom we left with a can-opener lay the thing down and dig for his check book? A mystery, here. Where people get money is always a mystery to those who never manage to get any themselves. For instance, I knew an airplane manufacturer who was broke but got his plane to the National Air Races.

(Continued on next page)

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(PersonAIRlities continued)

where he hoped to demonstrate it. Between demonstration flights he put on false whiskers and went around the stands selling peanuts. But this game got poor by the end of the meet; all the other airplane manufacturers found out about it, and were doing the same thing themselves until the racket finally got so crowded with airplane salesmen, pilots and publicity men that they used up all the customers and were selling peanuts to each other. I merely mention this to explain the mystery of how a lot of folk managed to support their planes at Chicago last year, because it wasn't generally known how they did it.

Mrs. Keith-Miller came to America with Harry Lyon and Bill Lancaster—who more formally is Captain W. N. Lancaster of the Royal Air Force. They came to do a movie, but the movie firm turned out to be infirm financially, so Chubbie remains in the ranks of the great unscreened. Since then she has been flying hither and yon. Came in eighth in the 1929 Ford tour, and third in the light plane class in the women's derby the same year. She was chief pilot for the Victor Aircraft Company until it ceased to be listed among the victors, and expired with a pathetic sigh. She won the fifty-mile race for women at the Cleveland races in 1929, and in October, 1930, she captured the women's transcontinental air record by flying from Valley Stream, L. I., to Los Angeles in twenty-five hours, forty-four minutes, returning ten days later in twenty-one hours and forty-seven minutes' flying time. She held that record until Miss Ruth Nichols took it away from her in a much faster and higher-powered ship.

So far so good. In November she took off from Pittsburgh for Havana, arriving there after some delays due to bad weather, with a flying time of twelve hours. On the return flight to Miami the bold Chubbie disappeared. She left Havana, expecting to arrive in Miami in two hours. Three days later we learned happily that she had aimed at Miami and hit Andros Island—which all the old men pilots cheerfully agreed was pretty good shooting for a woman, as Miami lies about north and Andros Island about east of the starting point. And after all, what is a mere fifty or ninety degrees on the compass among friends? Besides, perhaps the compass went haywire, as Chubbie claims; and certainly the weather was bad—and of course it makes a more thrilling story when a pilot disappears for three days—sort of builds up suspense and interest. I don't know what to make of it—I haven't seen Chubbie since, and women are always able to fool me, anyhow. I've long ago ceased trying to figure them out, convinced that it can't be done. Your guess is as good as mine; you pays your money and you takes your choice.

May I, for the moment, slip on the cap and gown of the dignified pedagogue, and say a few words on the subject of flying over water, out of sight of land, by the use of a compass? Mrs. Keith-Miller says that her compass was at fault. Perhaps it was, but perhaps she only thought it was. That can be determined by an examination of the compass. If it was all right *after* the flight, it was all right *during* the flight. So much is certain.

Yet while it may have been all right during flight, it may have been practically useless to guide the pilot on her course. The weather was bad, which may mean any condition. Let us suppose low visibility, rain, winds, rough air, patches of fog or mist. In those conditions it is practically impossible to fly an airplane on a compass course guided only by the magnetic compass. The sooner all pilots recognize that fact, the better. No matter how carefully you fly, no matter how straight you think you are holding the rudder, the ship will swing, upon which the compass will swing. You correct the swing, the compass swings back—and you find you have over-corrected. So you put on opposite rudder, get a bump, put on too much or too little, or the ailerons swing the ship somewhat as you correct the bump. And there you are, with a compass that is swinging with dignity from side to side.

You hold the rudder straight, slow down the compass—and find that you're flying east, when you hoped you had been flying north. You turn north, as you think, get more bumps, fly through mist, and the insane instrument is swinging again! You hold the rudder still, the compass slows, and there you are flying west!

By this time a cold sweat has appeared on your brow, and you are certain that your compass has gone phut and that you are lost. You're lost, all right, but your compass is not at fault—*you* are. You never should have left sight of land without that great aid to the compass, the bank-and-turn indicator. I'm not writing from theory in this matter, but take it from experience. Under certain tough conditions it is practically impossible to fly anything like an accurate course by means of the magnetic compass alone—the earth inductor compass is another matter. Trying to fly by magnetic compass, unsupported by a bank-and-turn indicator, you weave from side to side—slightly or badly, according to your skill or lack of it, and the conditions.

It was the late Brice Goldsborough who told me, years ago, "Don't try to 'fly' the compass—'fly' the bank and turn indicator. Keep your eye on the turn indicator, and keep the indicator pointer at center. Then glance from time to time at the compass, to see that you are on your course. If you are off a point or two, or ten points, look back to the turn indicator as you make the correction—never mind the compass. Get the turn indicator centered again and fly along. After a while glance again at the compass—it will have swung back and forth, and settled down. So far as the flying of the ship is concerned, forget you have a compass. Fly the turn indicator."

I tried this out during the summer of 1929 when I was flying the Cleveland-Detroit Duck run across Lake Erie—in which I finally landed in the drink, by the way, so I'm not so smart myself. On many occasions we were out of sight of shore in thick weather, with a still lake that gave no waves by which one could check drift. I found that when I ignored the turn indicator and flew only by compass that it was utterly impossible to fly an absolutely accurate course. With the turn indicator, however, it was child's play to keep right on any selected degree on the compass.

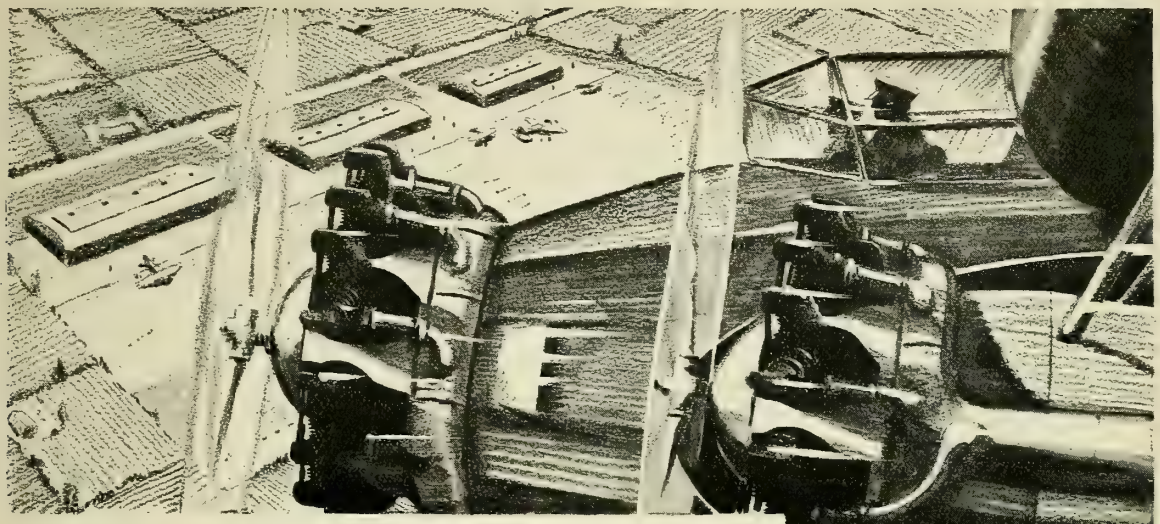
Pardon me if I seem to preach, but when pilots go careering across water, miles from land, with only a compass to guide them—as Mrs. Keith-Miller did—it is time someone got up and said a few words, in the earnest hope that others who may essay the same sort of flights may prepare for them adequately. I would remind them that the Gods, like ourselves, grow careless. Besides, they're really too busy to watch us all the time and to correct all our errors and omissions. If we fly out into the Atlantic and get lost, for instance, it is too much to expect that the Fates always will be kind enough to reach down and shove Andros Island under our wheels.

SEE the brave pilot standing beside the British war plane, complete with Vickers gun, ready to go up and shoot down a few of the enemy. The fighting pilot is Bill Dowling, Waco and Fairchild dealer at Fullerton, California. And have you learned to distrust all pictures from California? You might as well learn right here, for Bill isn't in the British Army, and neither is the Waco beside which he is standing; nor is the gun, which is a dummy made of wood. So there's another illusion shot for my poor young friend Chalmers of Akron—who used to believe everything and now believes nothing, he tells me.



Bill Dowling

Bill, to be perfectly candid with you, is going up, not to shoot, but to be shot, by the movie camera in the year 1927, and not 1917. He learned to fly in 1924, out in the land where nothing is real, once it's been photographed. Bill started on the Jenny and graduated to Wacos and Fairchilds. He runs a school, flies for the movies out in the deserts of Arizona, and has his picture taken. Sorry I missed you at the Races, Bill.



DURING 1930 ····· *More than*

7 MILLION AIR TRANSPORT MILES!

AIR transport service is the greatest builder of public confidence in aviation! Day and night these fast air liners fly—in blistering desert heat, through sleet, snow and sub-zero weather over the highest mountain peaks—carrying passengers, express and mail safely and swiftly over 31,141 miles of airways.

It is significant that Richfield-fueled air transport planes have flown more than 7,000,000 miles during 1930—nearly 20,000 miles daily in this grueling service where results are measured by one thing only—operating efficiency!

Richfield fuels the planes of Transcontinental & Western Air Express, Inc.; Pan-American Airways; New York, Philadelphia and Washington Airways; Mid-Continent Air Express and West Coast Air Transport. Richfield has served Western Air Express since its inception—the line whose record of more than 7,000,000 miles without a fatality to any passenger is unequaled in aviation history.

Play safe—and use Richfield in your own plane. You can get it at important airports both east and west of the Mississippi river.

RICHFIELD OIL COMPANY—LOS ANGELES - NEW YORK CITY

RICHFIELD AVIATION GASOLINE

RICHFIELD

OUR READERS AIR THEIR VIEWS

Grandison Gardner recommends wheelless airliners, catapult take-offs, and arresting gear landings:

"I should like to see some mail or passenger-carrying line operating on a regular schedule between large cities (where regular airports are necessarily far from the business districts), try landing on skis and taking off with a catapult, in order to make use of more restricted landing areas that could be found nearer the business centers. In cases where propeller clearance permits, landings could be made on the fuselage and the conventional landing gear dispensed with completely, thus adding a few miles to the flying speed. Arresting gears similar to those used on aircraft carriers would not be impractical.

"Such equipment could not be so conveniently operated on the ground, but time necessary to move such a craft after landing and to prepare it for take-off is unimportant as far as speed in transporting mail or passengers is concerned. Wheelless airplanes on crowded airports would, of course, be a nuisance, and they would not be desirable except for restricted flying; but where all landing are made on two or perhaps three definite fields, such a system offers but few disadvantages."

H. S. Mazet commends coöperation in seeking a solution to sales slumps:

"There is a maxim that history and business repeat themselves, the former along parallels of considerable magnitude, the latter with cyclic vicissitudes often strikingly similar in their salient characteristics. Yet without undue effort we can pick out here and there the inevitable exceptions which contrast so strikingly with the general run of economics.

"In one particular, modern case—the business of aviation—there is no precedent. Quite unlike any business before it, highly dissimilar in growth and rate of growth, unique in financing, colossal in overexpansion, uncertain in retrenchment and unpredictable in progress, this newest industry presents an amazing chapter in modern business life. And all the attendant evils of growth were present—until a very short time ago. Many recall with little affection the wildcat aviation stocks purchased from an unknown and transient firm which soon took to its own wings and disappeared into the stratosphere, never to return to its home airport.

"During this period prices for equipment were too high, air travel was expensive, competition was submerged under a flood of orders, and in a buyers' market no one gave heed to the needs of a competitor or, indeed, to the industry itself.

"But the debacle arrived. Down came prices, factories closed, personnel disintegrated. And in conjunction with the country-wide economic situation, many jobs ceased to exist, as pilots in particular will tell you.

"One lesson of imposing dimensions is derived from the chaos, which is already showing air progress toward homology. Manufacturers, dealers and operators now realize that the most efficacious means of rejuvenating the industry and returning to normalcy on a sound basis is through coöperation. Ruthless price-cutting and other cut-throat practices which became prevalent when the need was evident for boosting sales, have finally and beneficially gone by the board.

"Already the faint glimmerings of coöperation are to be seen in the individual direct-mail campaign here and there through the country. One such attempt addressed to licensed pilots quite commendably does not limit itself to emphasis on the sales angle, but drives home the crying need of more positions for pilots through increased use of aircraft by individual owners, and is quoted below. If, to this necessarily limited campaign, were added one participated in by a hundred aircraft manufacturing companies, the business would doubtless once again prove that "it pays to advertise," for it could and should be directed not only to pilots but to the public at large who, as is thoroughly demonstrated by the Ludington Line, will use air travel when it is sold properly.

"See if there isn't a lot of good common sense in the following letter directed to pilots:

"'Dear Mr. Pilot:

"'I am wondering how you feel about the great number of pilots that are out of jobs. Frankly, it concerns me a great deal. And how is that—you ask? Well, if the public—the GREAT PUBLIC our political friends have broadcast to—realized the possibilities of aviation as you and I do, good pilots would still be in demand and there would be, incidentally, a greater demand for airplanes.

"'No one can sell aviation like a good pilot, so I am wondering if you don't feel as I do, that it is time for all pilots to realize their obligation to their profession and SELL THIS NEW MODE OF TRANSPORTATION BY PERSONAL EFFORT AND CONTACT. Surely there is someone whom you know that should be using aviation in their business or maybe they would be interested in it as a sporting venture. Can't you approach them personally and sell them on yourself and this business of flying?

"'In so doing aren't your chances good for getting yourself or a friend a job? While we would like you to sell a Stearman when you do this—our vision covers the entire field and we would suggest that you sell Kitty Hawks, Bellancas, Stinsons, Pitcairns or any other aircraft that you, with your experience, can unqualifiedly recommend—the idea is TO SELL.

"'Every Stearman distributor and dealer will be glad to work with you in the development of any Stearman sale. It should be borne in mind, however, that all distributing organizations are operating on a small volume and comparatively high over-head. This implies your conscientious coöperation. Your major compensation should come from obtaining a position for yourself or friend or making more permanent the position you now hold.

"'Stearman literature and other forms of sales helps can be obtained from the Stearman distributor nearest you or from the factory. It is high time for everyone to pull together and sell air transportation in a way that aviation will occupy the place in our everyday life it so rightfully deserves.

Yours very truly,
J. E. Schaefer,
The Stearman Aircraft Company.

Denis F. Cashman disputes the decision to operate air service from America to Europe via Bermuda and the Azores:

"Seeing by the daily press that the Post Office Department is asking bids for an air mail route across the Atlantic 'from New York, by Norfolk, Va., by Charleston, S. C., and then by Hamilton, Bermuda, and the Azores, *or some other practicable route to a point in Europe,*' I wrote the department inquiring whether 'some other practicable route' might be construed to mean the Newfoundland-Ireland route.

"The reply contains the following sentences which I quote in full. 'The advertisement states New York as the initial point and it is not believed that it would be practicable to fly from New York via Newfoundland to Ireland at present, and the Postmaster General would not, therefore, accept proposals on such a route under the pending advertisement.'

"'The southern route, because of its comparative freedom from fogs, is believed to be the only practicable route for regular service at present.'

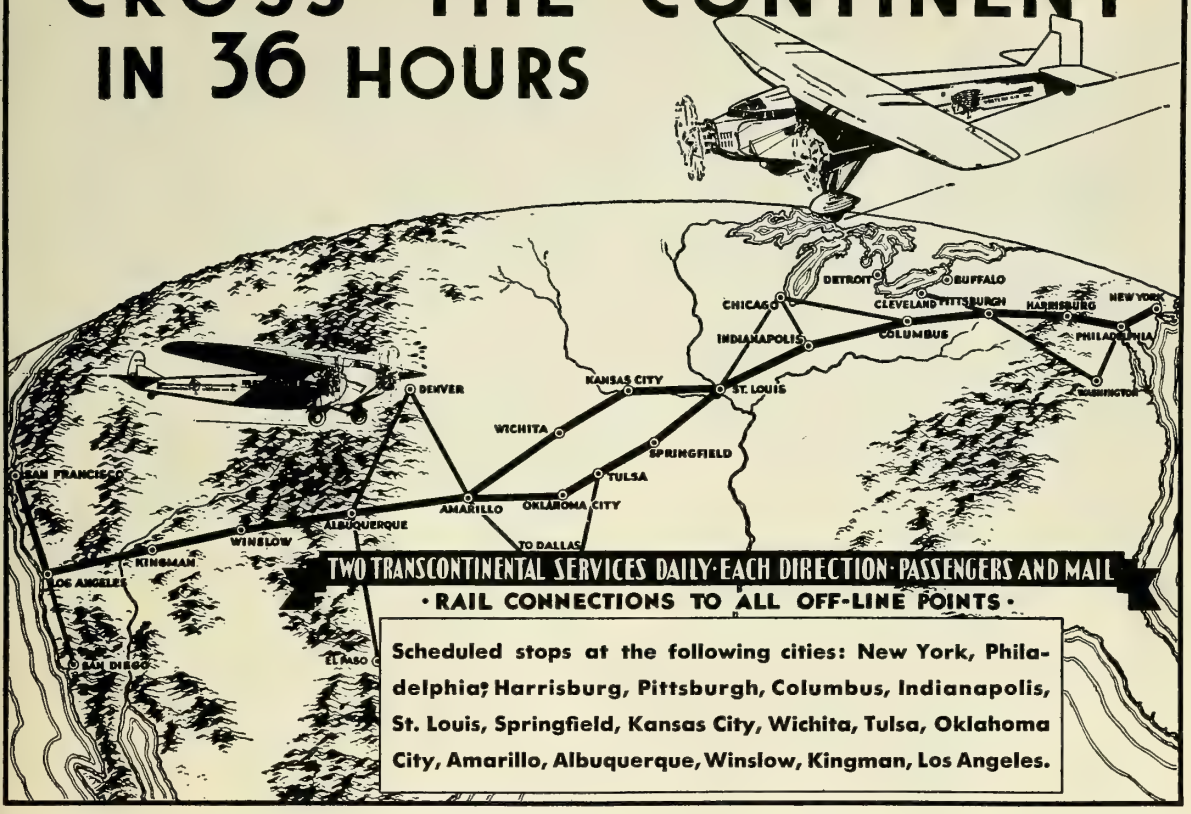
"That's that.

"The Post Office Department must believe strongly in the old adage—'The longest way around is often the shortest way home.'

"How about the use of radio beacons to guide the ships from New York and also from Ireland, such beacons being placed at the landing field at Newfoundland and at the landing field at Ireland?

"Surely it would be cheaper to equip two fields with powerful radio beacons than to have landing facilities at Bermuda and the Azores and others somewhere in Europe."

CROSS THE CONTINENT IN 36 HOURS



Across America in two giant strides! New York to Kansas City in one day — on to Los Angeles the next. An overnight rest between at a hotel in Kansas City.

That is the new service that the merged resources of Transcontinental & Western Air, Inc., offer in their 36-hour daily all-air schedule. It gives the cross-continent traveler the very utmost in speed and comfort — replaces ordinary travel monotony with new and unforgettable pictures of America's cities, plains, rivers and deserts.

Full information as to schedules and rates will be gladly given you by the offices of Transcontinental & Western Air, Inc., in principal cities, or by any travel bureau.

TRANSCONTINENTAL & WESTERN AIR, INC.

Maddux Air Lines Co. Transcontinental Air Transport, Inc. Western Air Express, Inc.

New York City: 929 Graybar Building Los Angeles: 117 W. 9th Street

THE NEW MUNICIPAL AIRPORT AT INDIANAPOLIS

INDIANAPOLIS opened its 947-acre municipal airport October 25 when the first westbound plane of Transcontinental and Western Air, Inc., landed with mail and passengers.

First steps to acquire the airport were taken in August, 1928, when several financiers, professional and business men named on a committee by the chamber of commerce started plans to obtain the land. A total of $286,000 was paid for the site, a very nominal sum for farm land in this territory. Since that time an additional $25,000 has been spent for a 100-foot entrance to the port.

The field, almost square in shape, consists of 947 acres. It is 6.7 miles from the center of downtown on the national highway, a forty-foot paved highway. It is possible to motor from the business district to the port in twenty minutes.

The location of the port is conducive to varied aviation activity. Adjacent to the field on the north lie the main line of the Pennsylvania Railroad and an electric line. One hundred and seven acres adjoining the right-of-way of the tracks has been set aside as an industrial site, available for aircraft factories.



The combined hangar and administration building nears completion

The field stretches one and one-half miles east and west, and one and one-fourth miles north and south. Except for a wooded area of sixty-one acres, which will be cleared immediately, the field is level and smooth—safe for landing and taking off. A uniform plan has been adopted for the future construction on the field of buildings, aprons, taxiways, drives, etc.

Under the existing soil and drainage conditions it was advisable to construct hard surface type pavements. Three runways were constructed, two of which are 2,000 feet in length, extending in the direction of the prevailing winds. The third, 1,100 feet long, runs from northwest to southeast, the direction of the winds during the winter months. Limitation of funds and the high velocity of the northwest winds which eliminated the need of a long runway were the deciding factors in making this paved strip shorter than the others. All three runways are 104 feet in width.

The three runways are so laid out that parallel runways may be designed later without interference of buildings and without hindering landings and take-offs on the original strips. Even though the parallel system will not come into existence until later, no building will be constructed within 500 feet of any runway. Should a solidly paved area be desired, it would be easy to pave between the runways.

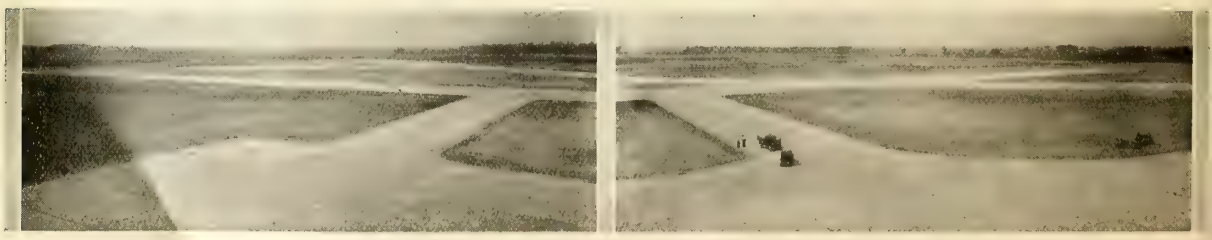
The north-south runway is connected with the apron around the building by two taxiways, one of which will be used as an approach and the other as an exit. This arrangement will reduce traffic congestion of planes arriving and leaving the building. The paved apron around the building consists of approximately 14,500 square feet of concrete.

The runway pavement was designed for a maximum wheel load of 10,000 pounds, assuming that any greater loads would not be recurring on any specific part of the slab. Steel mesh was used as reinforcing, not only to increase the strength of the slab, but to reduce the cracking caused by the unstable soil of the subgrade. Construction of the runways, taxiways, aprons, drives, sidewalks, etc., was completed at a total cost of $167,000.

A combination administration and hangar building is nearly completed. An interesting feature of the building is the complete glass (sides and overhead) tower which affords an unobstructed view of the entire field and upper air regions. Back of the offices is the hangar, 125 by 100 feet, open at each end. An outstanding feature of the building is the plan devised for handling motor car traffic. A ramp or long inclined one-way circular drive is constructed through the basement. By this means automobiles may drive into the basement to discharge or take on passengers at the base of a stairs and drive out.

A standard airport lighting system is being purchased and will be installed to provide safety for night fliers.

When the Indianapolis Municipal Airport has been fully completed and all equipment installed for lighting the field at night, Transcontinental and Western Air, Inc., will use this field as a regular stop on its coast-to-coast mail and passenger line. Other transport operators and aircraft companies are also expected to take quarters at the new port.



Three hard surface runways have been built at Indianapolis' airport; two of them 2,000 feet long, the other 1,100 feet

FAMOUS FLIGHTS WITH THOMPSON VALVES

'Round the World

IN THE RECORD-BREAKING

"CITY OF NEW YORK"



(This advertisement is one of a series recalling historic airplane flights in which Thompson Valves were used.)

For the first time in history, the world was circled in the incredibly short period of 23 days and 15 hours when John H. Mears and Captain C. B. D. Collyer made their famous trip in 1928.

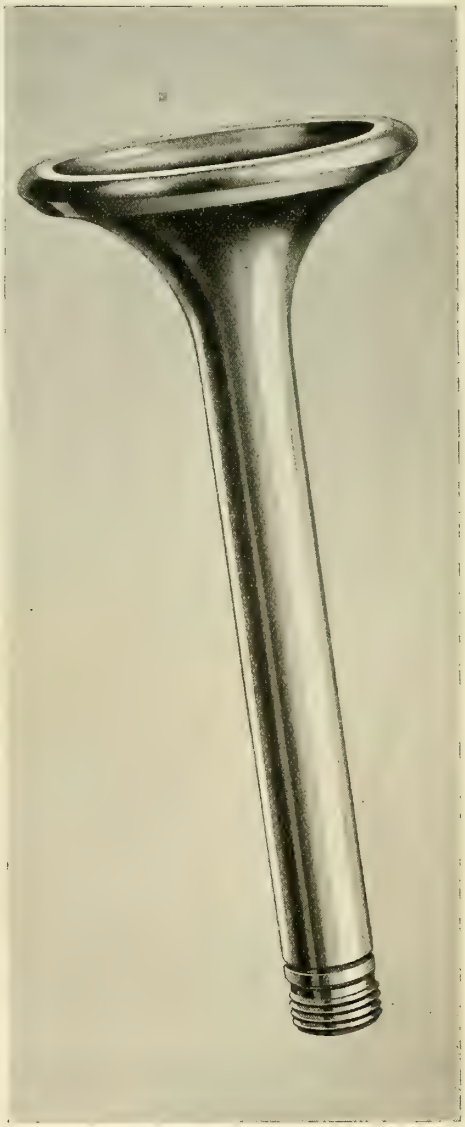
Leaving New York City with their plane "City of New York" aboard steamship, they sailed to Cherbourg, flew eastward overland by plane, crossed the Pacific by boat and returned from Seattle to New York by air. On July 22d, they completed the speediest trip 'round the globe ever made.

† † †

Only the perfect flying performance of the "City of New York" made possible this new world's record. The 18 Thompson Valves in the Pratt-Whitney "Wasp" motor of this famous plane contributed much toward unfailing engine operation.

It is such unvarying reliability in nearly every outstanding American flight since 1925 that has influenced the adoption of Thompson Valves for today's finest American airplane engines.

THOMPSON PRODUCTS, INCORPORATED
General Offices: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT



Thompson Valves

CURE-ALL OR MALADY?

Has the Slogan "Fare Not Fear" Proved to Be a Solution of the Passenger Problem?

By

Russell L. Putnam

EARLY last winter our airlines were operating with very few passengers. The argument was advanced that price was keeping customers away. It was claimed that a large share of the travelers were commercial people and their employing houses would not allow them to use airlines at the higher price—but if the rate was no more than that of the railroads, they would go by air. This argument won and air rates were cut to the bone—approximating the cost of rail plus Pullman. Air travelers increased in number more than 300 per cent, with an increase in revenue of approximately 200 per cent. What the increased costs of operation were, we do not know—those figures are safely locked in the files of the different air transport companies.

But we are safe in this statement—that the passenger airlines, as a whole, did not make and are not making money even with this increased patronage. They may be losing less money than when higher prices were in effect, with practically no passengers being carried, but still we have not found a way to get sufficient volume from passenger operations to show us a way out of the dilemma. The enactment of the Watres bill by Congress may be interpreted as a way out of the difficulty. Indeed, it was largely intended as such, for it makes practical the combined operation of passenger and mail service. Yet, after all, the Watres Act does not solve the problem entirely so far as passenger carrying is concerned. The passenger business, of itself, should be as nearly self-supporting as possible. Is passenger service to be nothing more than a generous but unprofitable gesture on the part of the airline company—a gesture for public good-will sustained by revenue from mail business?

So far as passenger carrying is concerned, we are still confronted with the vicious circle of operation costs being too high because volume is too low, and because volume is too low, prices must remain high. Or if we cut prices we suffer heavy losses in operation—our net gain being that more people are becoming accustomed to air travel.

But let's examine just what that net gain really amounts to. Neither prior to, nor subsequent to, the price cut had the airlines of the country done a thorough job of analyzing the advantages which their air travel offered the traveling public and then selling these prospects on air travel as a valuable service worth real money to them. Therefore, the new customers who were enticed into air travel were enticed solely because of the price angle and not because they believed it offered outstanding advantages to them. Undoubtedly a high percentage of them were people of low income who could not afford to pay a premium for an unusual travel service—still others who could afford such premium were not completely convinced that this service was really worth more. (This is particularly true in the cases of business houses that will not let their travelers ride airlines at a higher price.)

Therefore, our net gain amounts to attracting people to use the air, many of whom we can never expect to carry if we raise prices to a level where we can break even or make money, and others with whom our selling job is still undone, particularly those whose employing houses must pay the bill. Hence, if we plan to raise prices later we must expect to lose most of these patrons we have so expensively "educated" to air travel. In brief, our big educational job, with 300 per cent increased patrons, dwindles down to a vanishing point.

So we are forced back to basic fundamentals—to basic facts which every industry has had to recognize. If we expect to build a good volume of customers, we must *sell them* on the advantages our service offers, and then we must get a fair price for that service.

It is pleasing to speculate on what we could do if equipment and operation cost sufficiently less—and that day will come, but not soon enough to answer the present problem—to allow us to compete with trains on a price basis and offer all our advantages as so much "velvet." But we are facing a condition—not a theory. We are up against the need of selling a new, advantageous travel that costs more and is worth more. And there are many prospects who can afford what we have to sell.

If any one questions the existence of many prospects who will pay a premium for de luxe, rapid transportation, let him watch the three, four or six sections of the Century pull out of Grand Central or La Salle Street stations most any day. Or let him check any one of a dozen or more such trains on lines all over the country. Let him read the advertising of the New York Central's new individual rooms with real bed, at $70.88, between New York and Chicago—almost



Its engines pulsing with restrained power, a Western Air Fokker F-32 prepares to take off with its complement of passengers

double the regular train fare. If the airlines could develop only as much business as these de luxe trains carry, and get a fair price for it, the millennium would seem to be with us. The railroads got this business through perfecting their service and *aggressively selling it to the public.*

It is axiomatic to say that any new product or new service that is to be sold must offer more than the old products or old services, if an increased price is to be gotten for it. Or the new product or new service must offer equal value for less money if worth-while sales are to be secured. Our service obviously falls in the class of greater value for a higher price.

Haven't we, in the aviation business, overlooked a cardinal principle of all business—a principle that no industry has ever long ignored without paying a heavy penalty? With all our enthusiasm for fine equipment and splendid operation haven't we forgotten that all the money we spend in this way can be returned only as our service is used and, as the old saying goes, "You have to tell 'em, to sell 'em"? No doubt these past three years of wholesale aviation publicity have spoiled us. For a while we could sell more than we could make, at almost any price, and with no effort even to ask for buyers—yes, even if we treated prospective customers with an indifference that amounted almost to insolence.

But this last year—how different it is! We find that our increased production is not finding buyers. This free publicity which tickled our vanities so—even that seems to have had a boomerang quality. As often as not it seems to have hurt business, for it hasn't told the business side of our story. We turned to this price panacea, hoping for a cure-all—but what about the need of money spent in intelligent selling to wipe out resistances?

Perhaps we do not need to worry about selling. We don't—IF,

(1) We can operate at heavy loss for an indefinitely long period of years, until our prospect public searches out "better mouse-trap makers" in our woods, and insists on buying our "better traps" in a quantity that will show a profit; or

(2) by some sort of production alchemy we can build more efficient equipment at a revolutionarily lower price and thus slay the demon in red figures; or

(3) the "miracle" comes to pass, and the public flocks to buy what we have to sell without knowing just what advantages we offer them.

But can we wait for miracles? Or even if lower costs would enable us to make a profit on present volume, should we be content with a slow "natural growth" of that volume? Or should we adopt the tactics of every other successful industry and stimulate that growth? Or, barring these happy endings, who will be the "angel" to pour more and more money into our enterprise until the millennium arrives?

"Well, what are you going to do about it?" you may well ask. Let's quit the "Gloomy Gus" stuff and talk something concretely constructive.

First, let's examine our product to see if we really have something we should expect people to buy. An airline to offer advantages must obviously do something that other transportations do not do. For example, an airline between the airports of Chicago and Milwaukee (referring to landplane service only; amphibion or flying boat service brings up an entirely different set of conditions), or between the airports of Dallas and Fort Worth, offers very little, if anything, since air travel time plus time from town to airport, and airport to town, almost equals or exceeds the time required for interurban or train travel. Perhaps this difficulty is not the fault of air travel—rather the fault of accessory service—but air travel must shoulder the handicap. It seems highly probable that some airlines have been established, and more will be, where there is no real advantage over existing transportations. Obviously such lines have no economic right to existence.

Such criticism, however, does not hold for many airlines. The advantage in time saved is, in most instances, well worth while even though in some cases schedules do not fit in with business and social habits to make the time saving of greatest usefulness.

Here is a typical experience. A commercial traveler—one who has never been in the air—recently told me that he travels frequently between Chicago and St. Louis, but could see no advantage in using the airlines. He pointed out that on one particular day he took the 12:15 train from St. Louis while a friend of his took the 12:15 bus from the hotel to go to the airport for the afternoon plane, and their arrivals in downtown Chicago were within fifteen minutes of each other. Hence he saw nothing of value to him and hence had no interest in air travel, regardless of price. This case may be slightly exaggerated, but it tallies too closely with many experiences to be cheering.

Assuming, however, that we do offer real advantages, as we do in most cases, what about the element of fear? Obviously we must eliminate or so diminish danger that the risk of air travel does not overshadow the advantages.

I have discussed flying with literally hundreds and thousands of people over this country. And their expressions indicate that almost none of the public appreciate what air travel is really like—instead, there is a deep-seated and unreasoning fear of flying in itself. The following is taken from a letter written by one of America's most progressive, and most successful industrialists:

"While costs of operation and all other factors are naturally of very great importance, the one outstanding point in which I am particularly interested at this stage of the game is the factor of safety.

"The science of air transportation has been mastered as far as locomotion is concerned. The main problem for the executive to consider is the degree of safety with which it can be used. Our company now has eight plants in six different cities in three states. Some of our most important men are constantly having to travel around the circle of these plants. Undoubtedly much time and effort could be saved by air transportation; the whole problem is, can we as yet afford to risk the lives of men who cannot be replaced just to make a saving in time."

Many other letters and comments bear out this same point, that people do not know what values air travel offers and they fear for their safety in case they should travel by air. Seldom is price mentioned except as a check against value.

Can any one talk to a hundred responsible citizens and still believe that the demon "fear of flying" has been killed? Surely we still have a real job here—both in selling the public on the real safety of up-to-date airlines, and in making those airlines even safer. We must put safety above schedules and wait for better weather devices before we venture too far in fighting nature with precious cargoes of human lives aboard. And we must clarify, in the public mind, the distinction between races, stunts, military flying and record seeking flying and the conservative flying of air transport. Today the accidents of all militate against us.

Having gained these objectives—making sure that our lines do offer real advantages and having conquered the element of fear—how can we sell this service that a fair price may be secured? Why not show how these advantages will return a profit even though rates may be higher than for other travel? For example, a business man of the $10,000 to $15,000 class needs to save but a day in a week's business to justify an additional expenditure of $30 to $45 on the basis of salary saved—in addition there are the savings on hotel accommodations, meals, etc.—and, more important still, the opportunity for this man to do a better job at his work which should net incalculable profits.

It is very probable that many lines could show an actual profit in air travel for men of much lower salary. Yet practically nothing has been done in working out these advantages and in telling the employer-concern about them. Doesn't it seem logical that if this were done, many concerns would change their policy and urge their men to use air travel wherever there is an opportunity of profit even though rates are higher than for train?

Surely here is a great opportunity—in analyzing the real advantages of air transport and selling them to the traveling public. It will cost money, but isn't it a quicker way to black figures than reducing rates to suicidal figures and hoping that customers will somehow find out what we have for them?

(*Continued on next page*)

(*Continued from preceding page*)

During the past few months several conversations have impressed themselves on my mind—conversations which, it seems to me, open up a great vista of opportunities to improve and to sell air travel.

An advertising salesman—with an income well in five figures—tells of his only experience in using the airlines, though he travels constantly through the Middle West. One afternoon in Dayton he sought out the local air office regarding transportation to Chicago. This office advised that a plane would leave Cincinnati at 5:00 o'clock and promised to get a reservation for him. Calling back a little later, he was told there was no room on the 5:00 o'clock plane, but they had made a reservation for him on the 4:00 o'clock—they gave him a note certifying the reservation and stating the fare to be paid on his receiving the ticket at the Cincinnati office. He made the trip to Cincinnati, called at the air office and there was advised that his ticket would cost him $3.00 more than his note specified. Of course, he protested. The reply was that this 4:00 o'clock plane did not stop at Indianapolis, hence the increased fare, but they could not explain Dayton's ignorance of this fact. Naturally the passenger was disgruntled at the start. And, arriving in Chicago, alighting from the plane, he was given a farewell blast when the pilot opened up the motor, swung the tail of the ship, and covered all passengers with dirt, sand and dust mixed with oil and grease. Since that date this traveler has not tried the air.

An editor, who travels extensively over the United States, advised me that he never uses the airplanes. He added: "I don't doubt but that there are many lines I could profitably use, but I know nothing about them, because I do not get any information as to where they go and when."

I explained that in Chicago, where we were, there was a central air office which had all such information—and then was amazed to find that I did not know the name of this office or how to call it. I, too, needed selling.

A man from Oklahoma City came to Chicago some weeks ago on his first air trip. Telling me about it, he exclaimed: "But it cost me almost as much to get from your Chicago airport to downtown Chicago as it did to come up from Oklahoma City." Questioning this, I learned that some one who seemed to be a porter had taken his bag and in response to his inquiry for the bus, had walked over to a taxicab, deposited the bag, and stated, "Here's your car." The passenger again asked if this was the regular airline bus and was assured it was, both by porter and driver. Arriving downtown, the bill was in excess of $3.00.

Obviously a "gyp" game, but when I phoned the office of this airline I was met with casual indifference about the whole affair. No one seemed to worry whether the passengers were fleeced or not. Fortunately, after explaining something of the situation that exists in airline operation, the fleeced passenger was able to take it as something of a joke on himself, and he has since used the airlines quite extensively.

A friend called me on the phone for information on air travel to the Southwest. I suggested calling the information bureau, which he did. Twenty minutes later he called back to ask me where the municipal airport was and how he could get out there. Evidently the information bureau was accustomed to leaving it up to the prospective passenger to use his own ingenuity in finding the airport.

A few days ago I met an evening plane at the municipal airport to greet an arriving friend. The ship came in on schedule, unloaded passengers, and as we were walking to the office to claim my friend's baggage, we were suddenly enveloped in an aggravated Texas sandstorm, with generous portions of airport dirt and oil thrown in—a thoughtless, or playful, pilot had swung the ship's tail around so we got the full blast. Had the pilot heard what we said, I fear we should have had a slander suit or a fight on our hands.

In contrast, note this excerpt from a current advertisement of the B. & O. Railroad:

"Years ago we realized that our railroad could never succeed without the good-will of women travelers. . . . We thought over the little things that we might do to win their patronage. We knew that woman, for instance, dislike jolts and jars. So our engineers were coached to start their trains without shake or jerk, to run at an even, steady pace, and come to a stop *smoothly*.

"We asked our engine crews to avoid

(*Continued on page* 124)

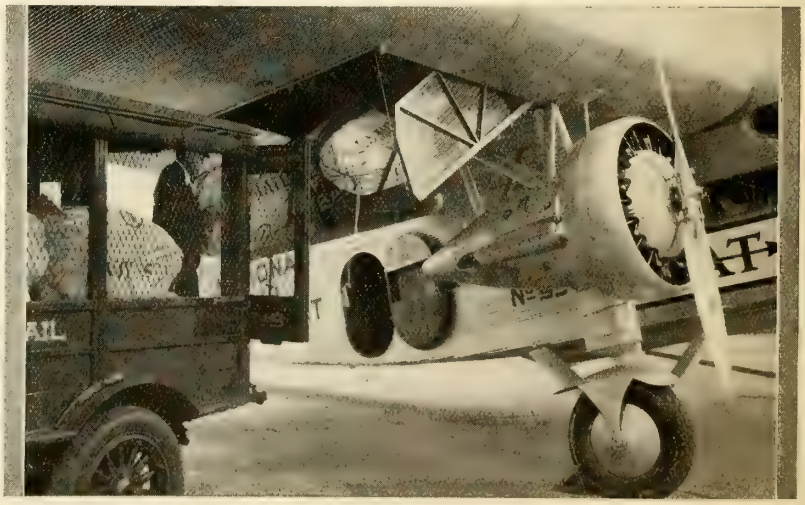
N. A. T.-FORD WING MAIL COMPARTMENTS

FITTED with new equipment enabling them to carry heavy mail loads in compartments concealed in their wings, six new Ford trimotor high-speed transport planes have just been put in service by National Air Transport on the New York-Chicago leg of its passenger and mail routes. The mail compartments, as designed by engineers of the Ford Motor Company and approved by Postmaster General Brown, will enable the new type transports to carry very large mail loads in addition to their passenger complement.

This new departure in the design of Ford transports is an outgrowth of the new air mail act, which was so framed as to encourage the carriage of the nation's air mail on scheduled air passenger services to as great an extent as possible. The new method of carrying the mail cargoes in the wings in space hitherto not utilized and thus permitting the use of the cabins solely for passengers was devised by Ford engineers working in coöperation with National Air Transport officials.

The mail compartments are fabricated of duralumin and are in reality strong boxes which can be carried in recesses in the wings outside of the center section. The bottom of the compartment is formed by the lower surface of the wing, the lower edge nearer to the fuselage being hinged so that the entire compartment may be dropped down by use of a rachet and cable to facilitate loading.

When drawn back into place in the wing, the compartments strengthen its structure, being built up of strong girder-type trusses which lend added rigidity. The compartments are located over the center of gravity line, thus permitting large loads to be carried, while retaining the inherent maneuverability and stability of the plane, something which is not always possible when mail loads are carried in the after cabin.



Loading mail into the wing compartment of a N.A.T. Ford trimotor

THE FASTEST SELLING LINE OF AIRPLANES!

AMERICAN EAGLET

(ONE PLACE)

THE WORLD'S PREMIER
FEATHER WEIGHT AIRPLANE

$995.00

Aeronautics Branch, Department of Commerce

APPROVED TYPE CERTIFICATE

$1475 THE ONLY TWO PLACE DUAL CONTROL 30-H.P. MOTOR AIRPLANE OF ITS TYPE APPROVED BY THE GOVERNMENT **Nº380**

NOW READY FOR DELIVERY!

Write or Wire for Red Hot
Sales Proposition

AMERICAN EAGLE
AIRCRAFT CORPORATION
FAIRFAX AIRPORT KANSAS CITY, KANS.
"MASTER OF THE SKIES"

CURRENT AIRPORT and AIRWAY FACTS

THE longest scheduled passenger-mail service over water in the world began operation on December 2 when a twenty-two-passenger Commodore flying boat took off from Miami for the first flight over the 1,358-mile route to the Canal Zone. The service is operated by Pan American Airways, Inc.

The line serves four countries: United States, Cuba, Jamaica, and the Canal Zone. All but fifty miles of the route is over water. The trip will be made twice weekly each way.

This is the third air route from Miami to the south operated by Pan American Airways. Of the other two, one follows the Central American eastern coast and the other the fringe of the Windward and Leeward Islands, forming the eastern border of the Carribean Sea.

ALL air transport operations of the Thompson Aeronautical Corporation have become a division to be known as Transamerican Airlines Corporation, officials of the company recently announced.

The new division will take over air mail, passenger and express lines serving eighteen Middle Western cities, including Chicago, Detroit and Cleveland, and Buffalo. The sales and service divisions, active throughout the Great Lakes area, are not affected in name but become, with the new division, a part of the Thompson Aeronautical Corporation, the holding group.

Plans for the development of a "comprehensive air transportation in the Great Lakes region" motivated the formation of the new company. In line with this policy of expansion, one new line has already been inaugurated, operating passenger and express service between Buffalo, N. Y., and Detroit, Mich. This line constitutes the eastern link in the proposed system.

Multi-motored amphibions will be used in the new system, officials said. The company operates two private seaplane-amphibion terminals on the Great Lakes.

Plans for spring extensions include a passenger, mail and express line between Milwaukee and Chicago, and Milwaukee and Detroit.

A DECIDED discrepancy in progress of air mail and passenger business, with air mail lagging behind its usual mark, is revealed by various reports summarizing the business of the first six months of last year.

Air mail poundage dropped off 542,075 pounds from the total for the last six months of 1929, according to Department of Commerce figures. Payments to operators dropped $3,000,000. Passenger traffic, on the other hand, showed a gain of seventy-six per cent. Passenger miles flown showed an increase of 133 per cent. Increase in passenger travel during the early part of 1930 over the same period last year is placed by the National Advisory Committee for Aeronautics at 300 per cent.

The decrease in air mail business is viewed by W. Irving Glover, Second Assistant Postmaster General, as a reflection of business conditions in general, which have also affected postal receipts to the extent of a fourteen per cent decrease.

EASTERN AIR TRANSPORT, INC., which has long carried the mail from New York to Atlanta, has added passenger service over that route, tripling schedules between some points, and is inaugurating on January 1 an extension of the route to include Miami and St. Petersburg, Florida.

Between New York and Washington the company has added two new daily round-trip schedules, making a total of three round-trip schedules between these two cities. As the result of an agreement with the Colonial Air Transport division of American Airways, schedules have been coördinated so that the new schedules offer also speedy service between New York and Hartford and Boston.

Eastern Air Transport has a similar agreement with the Southern Air Fast Express division of American Airways, to offer service from New York to Los Angeles via the southern transcontinental route. These agreements are the first instance of such close coöperation between two large air transportation companies. Not only will schedules be coördinated; joint advertising will be done and promotional literature describing the other's routes will be distributed over all lines of each of the two companies.

The New York-Atlanta passenger line, inaugurated early in December, also carries mail, as will the Atlanta-Miami and Orlando-St. Petersburg flights. These schedules are in addition to the regular night air mail schedules which the company has long operated along the Atlantic coast. With the new services soon to begin, Eastern Air Transport will fly a total of 10,500 miles each day. With connections it will soon be possible to fly from either New York or Los Angeles to Miami and then from Miami through Central and South America or the West Indies.

For its new services, Eastern Air Transport will operate a fleet of forty airplanes, eighteen of them newly purchased. Curtiss Condors are used on the New York-Washington route, and Curtiss Kingbirds on the services south of Washington.

These planes will be equipped with Sperry automatic pilots as an added safety factor. Eastern Air Transport is the first company to adopt this instrument as regular equipment in passenger planes.

A NEW service out of Oklahoma City has been provided by the Bowen Air Lines, Inc., in establishing direct service between that city and Houston, Texas. The line operates on a schedule of three and one-half hours. According to Leonard G. Simon, traffic manager, this extension of service raises the number of air miles covered daily to 2,000.

Fare between Oklahoma City and Houston will be $28.50, including bus service to and from the airports. The ships stop at both Fort Worth and Dallas.

NATIONAL AIR TRANSPORT, INC., operator since 1926 of the Dallas-Chicago-New York air mail route, continues the organization of its passenger transport system, begun in December, with the inauguration on January 2 of a passenger service between Chicago and Kansas City. This service is inaugurated as an extension of the New York-Chicago service, which went into operation on December 1, offering, with Boeing Air Transport, an all-air service to California. Officials of the company state that the service will be extended to Tulsa, Fort Worth and Dallas within a few weeks. The passenger system from Chicago south will then follow the same route over which N.A.T. has long operated two daily mail schedules in each direction.

Trimotored Ford passenger and mail planes of a new type capable of a high speed of 152 miles an hour will be flown by N.A.T.

Operations at Kansas City will be carried on from Kansas City Municipal Airport, which has been the division point of N.A.T. mail and express operations in the Southwest.

In the organization of the new system, the service operated by the Stout Division between Chicago, Detroit and Cleveland has been discontinued. Equipment and personnel have been transferred to other of the company's services.

ON December 1 air passenger schedules on the Newark-Boston route of the Colonial Air Transport division of American Airways, Inc., were revised to include Hartford, Connecticut, bringing that city within an hour and fifteen minutes of Newark. This will be the first air passenger service afforded between these two cities.

Colonial schedules have been arranged so that planes leaving Boston and Hartford will arrive at the Newark Airport in time to make connections with Eastern Air Transport's new service to Washington and with National Air Transport's new passenger service to Cleveland, Detroit, Chicago and the Middle West.

All planes of the Colonial Division have been equipped with two-way radio telephone communication. Installation is completed and the system is now in operation.

THE Kern County-Los Angeles Air Line, a new service inaugurated to serve a large community in the San Joaquin Valley, began operations between Bakersfield and Los Angeles, California, in November. The line is headed by officials who have operated the Hampton Flying Service, offering charter and taxi service in that region. Ogden Osprey trimotored planes are being used.

Taft is the only stop on the line. Scheduled time over the route is one hour and twenty minutes. For the present one round trip a day from Bakersfield is scheduled, though it is planned to add other schedules as soon as the traffic warrants. An extension of the line to run farther north is also contemplated.

Terminals are Kern County Airport at Bakersfield and Los Angeles Airport at the southern end.

FAIRCHILD

AIRPLANES

New Low Prices!



Fairchild KR-21

Fairchild KR-21

Kinner 100 h.p. engine. Two-place Sportster and Trainer with complete equipment, including low pressure tires and brakes.

Former price, equipped as above.....$4525.00

Now

$3990.00 *Flyaway Factory*

Fairchild KR-21B

Kinner 125 h.p. engine. Same equipment as KR-21.

$4525.00 *Flyaway Factory*

Fairchild KR-34D

Comet 165 h.p. 7 cyl. engine. Three place taxi, sport and training airplane. Completely equipped.

$5675.00

Flyaway Factory

Fairchild KR-34C

Wright 165 h.p., 5 cyl. engine. Completely equipped.

Former price $6575.00

Now

$6200.00

Flyaway Factory



Fairchild KR-34C

We have for sale several factory demonstrators in both open cockpit and closed cabin models, which have been maintained in thoroughly first class condition and which are offered now at most attractive prices ranging from $2500.00 upward.

Wire or write for full information.

FAIRCHILD AIRPLANE MANUFACTURING CORP.

Farmingdale, Long Island, N. Y.

BRANCHES:

Hangar No. 5, Love Field
Dallas, Texas

J. B. Alexander Co.
Los Angeles Metropolitan Airport
Van Nuys, Calif.

DIVISION OF THE AVIATION CORPORATION

THE PARIS SALON DE L'AVIATION

By

Paul E. Lamarche

THE twelfth Salon de l'Aviation, which was organized by the Chambre Syndicale des Industries Aéronautiques, was held in Paris at the Grand Palais between November 28th and December 14th. It was without a doubt the greatest indoor exhibition of aircraft ever held in Paris. Large and enthusiastic crowds attended every day.

Of great importance was the international scope of the show. Exhibitors from many nations had products on display. Among the exhibits most eagerly anticipated by Europeans was that of an American all-metal Ford trimotor, two of which were recently shipped to England. I understand, however, that the plane arrived too late from England for demounting and remounting before the opening of the show so that it was sent instead to Le Bourget for demonstration flights. Several American accessory manufacturers displayed products through their European representatives. One of the most complete of these was the Pioneer Instrument stand. The Wright Whirlwind engine was exhibited by the Hispano-Suiza company, which builds these powerplants under license. In addition, one of the Polish planes was fitted with a Whirlwind engine built under license by Skoda of Czechoslovakia. Among the foreign exhibitors the Germans had the most comprehensive display, though Italy and England were also well represented.

As is customary, the Salon was visited on the opening day by President Doumergue of France, his aides, M. Laurent Eynac, the Air Minister, and other distinguished representatives of silk-hatted officialdom who always pay special visits to the foreign stands as a diplomatic compliment.

On entering the Grand Palais, one was immediately impressed by the many huge silver-winged commercial monoplanes, some of which were arranged in simulated attitudes of flight. Particularly was one impressed by their size and the luxury of their accommodations. In variety the displays ran the whole gamut of aircraft types. There were ambulance planes, huge bombers, small sport planes, gigantic flying boats and diminutive gliders. By far the largest completely assembled plane was the new twenty-seven-passenger Dornier Do. S flying boat. The new Fokker F. IX trimotor monoplane was probably the largest landplane exhibited. So numerous were the large transport planes and flying boats it would seem as if the spaciousness of the Grand Palais will not be great enough to house future Salons at the present rate of increase in size of modern aircraft.

Popular interest at the Paris Salon was drawn most consistently to two French planes which have won trans-Atlantic honors. As one entered from the Avenue Alexandre III, the vivid scarlet hue of the *Point d'Interrogation* of Costes and Bellonte against a dull background of many silver wings attracted immediate attention to the Bréguet stand; and toward the rear of the Grand Palais, almost under a balcony was the *Oiseau Canari* of Assolant, Lefevre and Lotti, the yellow wings of which overshadowed smaller planes in the Bernard stand. In strange contrast was the frail little monoplane in which Louis Blériot dared the first crossing of the English Channel in 1910. Also in the trans-Atlantic class, though not planes which have actually accomplished the crossing, were a twin-float Latécoère 28 seaplane, the type in which Mermoz recently carried mail across the South Atlantic, and the hull of a huge flying boat known as the Lioré et Olivier H-27, which has been designed for crossing the South Atlantic in the service of the Compagnie Génèrale Aéropostale.

The use of metal construction predominated among the new planes. Some of them even use metal coverings on the wings and fuselages. If we may judge by the many new commercial planes, it seems evident that at present the commercial plane is being developed faster than the military plane. Apparently, in their effort to produce the ideal transport plane, many of the French constructors are designing their ships after a single pattern—the trimotor or single-engined cantilever high-wing monoplane. Although each of these planes is characterized by some variation or refinement, there is evidently nothing startlingly advanced in the design of any of them.

With military machines the situation is different. For technical men there was much that was interesting in the revolutionary design of the Bréguet *Tout Acier* reconnaissance plane (which has been described in AERO DIGEST), the big S.E.C.M. 140-M multi-place combat plane and the large Blériot commercial monoplane. The latter was regarded by many as somewhat of an aerial monstrosity and by others as a rather daring and interesting type of transport plane in which some flying boat ideas have been applied to a landplane.

Viewing the Salon in the order of interest and importance, we noted among French planes, the Bréguet stand where, as mentioned, the *Point d'Interrogation* was exhibited with the panels of the fuselage removed on one side for inspection. There was also a *Tout Acier* (all-steel) sesquiplane which is more officially known as the Bréguet 270, and the new type 230 long-distance bomber.

The Blériot stand featured the new type B-125 commercial plane and the low-wing single-engine passenger plane (described in November AERO DIGEST), a single-seater Spad 91-C.1 and the famous cross-channel Blériot monoplane. The big B-125, one of the most revolutionary planes in the Salon, was closely scrutinized by visiting technicians. It has a large cantilever wing of wood construction beneath which are two well streamlined fuselages each of which accommodates six passengers and considerable baggage. Two water-cooled engines arranged in tandem are mounted in nacelles in the wing. The pilot's cabin, which is entirely enclosed, is placed between them. The landing gear consists of two inverted units extending from the center of the wing below the engine mounts to the bottom of the fuselages. Each unit has two wheels in tandem which are partially enclosed in the fuselages and when the plane is at rest on the ground the only points of contact are the four wheels, the tails of the two fuselages being off the ground in a position similar to the tail of a flying boat.

At the S.E.C.M. stand the new Amiot Type 140-M multi-place combat monoplane attracted much interest. It is a large cantilever wing monoplane powered by two Lorraine 700-horsepower "Orion" engines. Of special interest is the fuselage construction, with two decks in the forward part, the lower of which resembles the gondola of a dirigible.

Nieuport-Delage exhibited its newest single-seater *chasse* plane, type 82-C. 1, which is built entirely of metal. This company also exhibited a small single-engine cabin monoplane designed for the private owner and a new all-metal eight-seater single-engine monoplane known as the type 540.

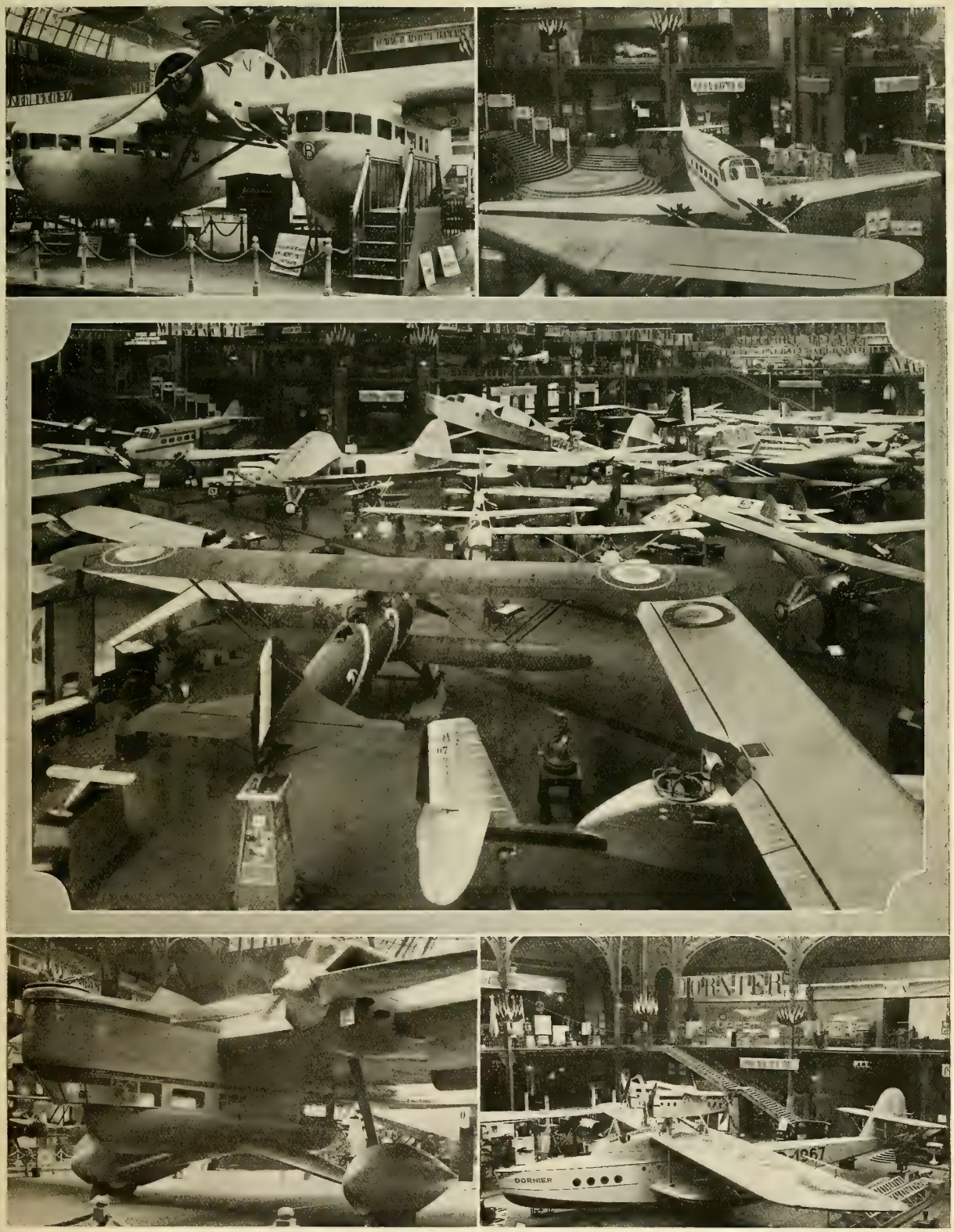
C.A.M.S. (Chantiers Aéro-Maritimes de la Seine) exhibited an all-metal monoplane flying boat known as the type 80. The C.A.M.S. display also included the hull of a new four-engine all-metal biplane flying boat, the type 58.

The Caudron exhibit included that company's new all-metal trimotor transport plane known as the C-180, and two sport planes, the folding wing biplane and the low-wing monoplane.

At the Dewoitine stand was the single-seater *chasse* plane, as well as two all-metal single-engine transport planes, the smaller of which has a well streamlined monocoque fuselage.

Lioré et Olivier exhibited, in addition to the hull of the new trans-Atlantic flying boat, a small touring monoplane flying boat and a four-motor version of the company's big night bomber.

The Potez exhibit included a new trimotor all-metal monoplane and the all-metal Potez 39 reconnaissance monoplane, as well as the little two-seater



Views of some of the exhibits at the international aero show, Paris, France, November 28 to December 14

cabin monoplane designed for sport use.

Of the several types of small two-seater flying boats for the private owner, the new Levasseur P.L.XII monoplane seemed to be the most beautiful. The Levasseur exhibit also included a naval reconnaissance biplane.

Morane-Saulnier presented several types of military training and pursuit planes as well as the D.H. Moth, built in France under a license agreement.

Wibault exhibited one of the largest of the French landplanes, a new all-metal low-wing transport monoplane. It seemed

(*Continued on page* 120)

THE AIR SERVICES

ASK FUNDS FOR NAVAL AVIATION IN TREATY BUILDING PROGRAM

Provisions for Naval Aviation Include Carrier, Airship Base and Flying-Deck Cruisers

CONSTRUCTION of a 13,800-ton aircraft carrier, a six-inch-gun "flying-deck" cruiser and acquisition of additional aircraft costing $5,000,000 are among the provisions for naval aviation included in a bill authorizing an appropriation of $134,635,000 to carry out the provisions of the London treaty over a period of several years. Charles Francis Adams, Secretary of the Navy, presented the naval building program to the House Committee on Naval Affairs at the executive session December 8. Following the session, Representative Britten, chairman of the committee, introduced the bill in the House.

Construction proposed in the bill includes the following:

One 7,500-ton six-inch-gun cruiser to cost $16,605,000, including six airplanes for the vessel.

One 10,000-ton six-inch-gun flying-deck cruiser, to cost $20,780,000, including thirty-six airplanes to be based on this ship.

One 13,800-ton airplane carrier capable of carrying 114 aircraft. This carrier and the planes for it are to cost $27,650,000.

One hundred and thirty aircraft for vessels built or building, to cost $5,000,000.

The new aircraft provided for in the bill will be used almost wholly on the new airplane carrier and other surface craft proposed in the measure.

The bill submitted to the House also includes an authorization for $5,000,000 for a dirigible base on the Pacific Coast. It was estimated by Mr. Adams that a separate appropriation at this time of probably not more than $15,000,000 would be sufficient to get started on the various projects. He stated that the navy supply bill would provide for an appropriation of $1,000,000 for beginning construction of the airship ZRS-5 by the Goodyear-Zeppelin Corporation at Akron, Ohio. This airship, he said, will eventually cost approximately $3,500,000.

Mr. Adams said it was proposed to let contracts for the airplane carrier by July 1, 1931; for the flying-deck cruiser by January 1, 1932; and for the six-inch-gun experimental cruiser by April 1, 1932.

CONSTRUCTION of all possible aircraft-carrying vessels is necessary to build up a fleet comparable with that of Great Britain, the House Committee on Naval Affairs was told December 18 during hearings on a bill authorizing a one-year building program.

David S. Ingalls, Assistant Secretary of the Navy for Aeronautics, recommended to the committee the construction of two flying-deck cruisers to secure the maximum experience in the operation of this type of vessel.

The committee voted to recess until after the Christmas holidays in order to hear testimony by officers of the Bureau of Construction and Repair of the Navy Department before taking action on the bill.

Naval Air Service Made New Safety Record During 1930

PILOTS of the Naval Air Service were within a fraction of one per cent of a perfect safety record in the 1930 fiscal year, according to the annual report of Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics.

Of a total of 252,095 flights, fourteen resulted in fatal injuries, making the flights 99.9945 per cent safe from fatalities. There were 430 accidents in a total of 266,984 flying hours; 14,832 hours per fatality were flown; and for each fatal accident 19,070 hours were flown. This is in comparison with 1929 when 6,773 hours per fatality were flown and 11,289 hours per fatal accident were flown.

Building at Lakehurst Naval Air Station is Speeded by Navy Department

CONSTRUCTION projects to cost approximately $50,000 have been authorized at the Naval Air Station, Lakehurst, N. J. Civilian employees totaling 259 have been employed at Lakehurst on construction work authorized previous to the additional development projects.

Sunnydale, Calif., Proposed As Site for Pacific Coast Airship Base

SELECTION of Sunnydale, Calif., by the House Committee on Naval Affairs as the site for the proposed Pacific Coast airship base was announced December 11 by Representative Britten, chairman of the committee. The committee voted to report favorably on the bill authorizing the Secretary of the Navy to accept 1,000 acres of land as the nucleus of the lighter-than-air station.

If funds are made available during this session of Congress for the development of the base and for the construction of the airship ZRS-5, it was announced that the Navy Department plans to have the West Coast base ready for use by October, 1932.

Ranger Is Name of New Aircraft Carrier

THE name *Ranger* has been selected by the Navy Department for aircraft carrier No. 4, the contract for which was awarded the Newport News Shipbuilding and Drydock Company. The *Ranger* will have a displacement of 13,800 tons and will be the first aircraft carrier in the U. S. Navy designed from the keel up for aircraft work in the fleet.

NAVY PLANS NEW TYPE OF SHIP TO CARRY AIRCRAFT

Propose Flying-Deck Cruiser Under Provisions of London Treaty

A NEW type of vessel known as the "flying-deck" cruiser has been proposed for the United States Navy as the result of a study of the London treaty. The projected craft is a cruiser equipped with decks to permit the landing and taking off of aircraft.

Under the limitations of the London treaty, the United States is permitted a maximum cruiser tonnage of 323,500 tons. Landing and take-off platforms may be provided on twenty-five per cent of the cruiser tonnage provided such vessels constructed under these conditions are not designed or adapted exclusively as aircraft carriers. This would give the United States 80,875 tons of cruisers suitable for the carrying of aircraft in addition to the total carrier tonnage of 135,000 tons.

However, these aircraft platforms can be constructed only on the six-inch-gun cruisers because all the eight-inch gun cruisers (180,000 tons) which can be constructed under the treaty have been built or authorized. In addition, only 73,000 tons of six-inch-gun cruisers can be built because 70,500 tons of the tonnage of 143,500 tons permitted for six-inch-gun cruisers has been utilized in the construction of cruisers in this sub-category. All eight-inch gun cruisers built or authorized have been provided with catapults and carry from four to six aircraft.

The construction of cruisers equipped with aircraft platforms has been recommended by Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics, Navy Department.

Appropriations for the construction of a 7,500-ton six-inch-gun cruiser and a 10,000-ton cruiser carrying six-inch guns and in addition equipped with an aircraft deck have been requested in the navy building program introduced in Congress December 8. The former will carry six aircraft and the latter will be able to carry thirty-six aircraft. The Navy Department plans to operate both these ships to determine by actual experience their cruiser possibilities before deciding what type of ships shall be built in this class with the rest of the tonnage permitted under the London treaty.

The 7,500-ton cruiser has been improved in design for a number of years. The 10,000-ton "flying-deck" cruiser represents something new in naval design because of its aircraft deck.

MAJOR BENJAMIN WARRINER of Medical Corps has assumed command of the school of aviation medicine at Brooks Field, San Antonio, Texas, relieving Major F. H. Poole, ordered to March Field, Calif.

ANNUAL AIR CORPS MANEUVERS TO BE HELD IN EAST

Concentration of Air Corps Planes and Personnel Scheduled Next May

THE greatest concentration of military aircraft ever staged in peace or war time will take place along the Atlantic Seaboard in May when the annual maneuvers of the Army Air Corps will be held for the first time in that section of the country, according to a recent announcement of F. Trubee Davison, Assistant Secretary of War for Aeronautics. A total of 250 military planes participated in the annual maneuvers of the Air Corps of 1930, which were based at Mather Field, Sacramento, Calif.

More than 500 Air Corps planes and 1,100 pilots and enlisted men will be concentrated at New York, Boston, Philadelphia, Baltimore, Wilmington, Washington and other points along the East Coast in the Annual Army Air Corps Field Exercises. Comprehensive tests to determine the ability of the Air Corps to meet a major coast defense emergency problem will be made over a territory that covers more than 100,000 square miles and almost a dozen states.

"While no definite date has been set as yet," Mr. Davison said, "nor has a final plan for action been determined upon, the tentative program calls for the concentration to take place during the latter part of May. The organization, to be known as the First Air Division, will be commanded by Brigadier General Benjamin D. Foulois, Assistant Chief of the Air Corps, and will consist of one headquarters group (about fifty planes); one transport group (about forty planes); three pursuit groups (about 180 planes); one bombardment group (about forty planes); and four observation groups (about 135 planes). To this number there will be added participating National Guard units and one attack group of about fifty planes. In addition there will be miscellaneous aircraft such as radio, photographic and ambulance planes.

"The field exercises will have a three-fold purpose: First, training and operation of a large number of units; second, unit combat training; and third, supply, ground and combat problems. All tactical squadrons in the United States will be summoned to serve in this major mimic air war as will, perhaps, representatives from the various National Guard Squadrons. It is also planned to call a large number of Reserve officers to active duty for 'duration of the war,' including numerous distinguished pilots no longer in military service and willing to take a refresher course."

Mr. Davison's announcement of the annual Air Corps maneuvers was made at the Yale Club, New York, N. Y., following an address on aviation at a meeting of the Chamber of Commerce of New York State.

Herbert Schiff Trophy Presented to Lieut.-Comdr. Ginder of Squadron 3-B

THE Herbert Schiff Trophy, awarded annually to the naval aviation squadron which flies the greatest number of hours without accident, was presented by President Hoover at the White House, Washington, D. C., December 5, to Lieut.-Comdr. Samuel Paul Ginder for Squadron 3-B of the aircraft squadrons of the battle fleet, which he commanded during the year.

Squadron 3-B, attached to the aircraft carrier *Lexington*, flew 4,958 hours without an accident, making 861 take-offs and landings. Approximately 600,000 square miles were covered in the course of these flights.

Commenting on the award of the Schiff Trophy to Squadron 3-B, Rear Admiral William A. Moffett said recently: "The Schiff Trophy has been won by 'Fighting Three' because eighteen planes were maintained mechanically perfect by sixty-five enlisted men who are unexcelled, and these planes were flown with safety by eighteen naval aviators who were ever elert, excellent pilots and loyal to the leadership of their squadron commander."

In the accompanying photograph, members of Squadron 3-B are as follows:

Front row, left to right: Lieuts. R. F. Hazelton, C. H. Quinn, C. H. Louis and W. E. Gladding. Middle row, left to right: Lieut. Comdr. G. F. Bogan and Lieuts. E. W. Litch, Appollo Soucek, R. R. Darron and F. Brunner. Rear row, left to right: Ens. R. H. Callahan and Lieuts. F. N. Taylor, R. Purvis, W. T. Stucky, R. B. Pirie, F. L. Busey, J. P. Heath, R. H. Ramsey and W. E. Rodee.



(P. & A. Photo)

Lieut.-Comdr. Samuel P. Ginder

LIEUT. WESTLEY WINS PATRICK TROPHY RACE

By PHIL RICHARDSON

THE Major General Mason M. Patrick Trophy Race was held November 22 at the home station of the Third Attack Group, Fort Crockett, Galveston, Texas. This was the first time since its inauguration in 1928 that the race has been held at home; the past two years it has been a regular feature at the National Air Races.

Despite the improvement in planes, the speed of 140.2 miles per hour attained by Lieut. Irvin Palmer in 1929 still holds the record for this speed classic. Lieut. Lawrence C. Westley, 90th Attack Squadron, won this year's race with an average speed of 135.6 miles per hour. Lieutenant Westley was also awarded the Galveston cup given in recognition of the most outstanding achievement in the group this year.

Nineteen pilots were chosen for this year's race, which was held over a sixty-mile course instead of the regular 120-mile course in order to reduce the wear and tear on the engines. Accurate check later placed the exact distance of the course at 54.546 miles.

Second place in the race was won by Lieut. Carl E. Recknagel, also a member of the 90th Squadron, with an average speed of 135.3 miles per hour. Third place went to Lieut. Tut Imlay, 60th Service Squadron, who attained an average speed of 135.2 miles per hour. The awards were presented at a banquet held in the evening. Additional trophies were presented by the *Service News* and the Houston Chamber of Commerce.



(P. & A. Photo)

Members of Squadron 3-B which won Schiff Trophy for best safety record, flying 4,958 hours without an accident



Douglas Basic Trainer in which General Fechet completed transcontinental flight

Fechet and Foulois, Air Corps Chiefs, Are Active Pilots in the Field

ALTHOUGH their duties require many hours at their desks in Washington, D. C., Major General James E. Fechet and Brigadier General Benjamin D. Foulois, Chief and Assistant Chief of the Army Air Corps respectively, spend as much time as possible in the field, often serving as their own pilots on inspection trips or long-distance flights.

General Fechet recently completed at Santa Monica, Calif., an inspection trip of the Air Corps. He accepted delivery of a Basic Training plane from the Douglas Aircraft factory in that city and flew the ship to Bolling Field, Washington, D. C. The flight was made in company with Capt. Ira C. Eaker, who piloted another Douglas plane which he had accepted for delivery.

While General Fechet was making the flight across the continent, General Foulois also made a long-distance flight, leading a four-ship formation and piloting his own ship the entire distance from the Pacific Coast to Bolling Field.

DAVISON ISSUES REPORT ON ARMY AIR CORPS NEEDS

Cites Need For Aircraft—New Traveling Records Made in Army Flight

PLANES of the Army Air Corps flew more than 32,500,000 miles during the 1930 fiscal year, according to the annual report by F. Trubee Davison, Assistant Secretary of War for Aeronautics, made public recently. This mileage established a new high mark in post-war military flying.

The report announced that the Army Air Corps has passed beyond the halfway mark toward the goal set by the five-year program created by the Act of July 2, 1926. While in a broad sense progress has been satisfactory, Mr. Davison reported, there still remain stumbling blocks which only legislation and sufficient appropriations can remove. The most important of these are:

Slow promotion schedules for Air Corps officers and inadequate grades and ratings for enlisted men.

Shortage in aircraft, owing primarily to the failure of the five-year building program to make allowances for the large percentage of planes which are constantly undergoing major overhaul in Air Corps depots.

Air defense at the close of the fiscal year consisted of 1,266 officers, 12,086 enlisted men, 1,319 planes on hand and 211 contracted for. According to the five-year development plan of the Air Corps, the third increment of which is covered in the report, there should be 1,374 officers, 13,140 enlisted men and 1,520 serviceable planes on hand. The number of planes contracted for would bring the equipment to the total specified in the Air Corps Act. However, the report points out, the 1,319 planes on hand include ships undergoing major overhaul, in addition to 133 aircraft which are more than five years old.

"The equipment problem," Mr. Davison said, "is primarily one of quantity. The quality of Army aircraft is improving and I take pleasure in reporting that important progress was made last year in the development of tactical equipment. However, while every effort has been made to carry the third increment to its conclusion, the result is not as satisfactory as it should be, because, under the interpretation thus far made of the Air Corps Act, there is not enough equipment to meet the flying needs of the pilot personnel called for under the terms of the law."

Included in the recommendations made by Mr. Davison are the following:

The speedy enactment of legislation designed to alleviate injustices affecting commissioned and enlisted personnel with respect to promotion, pay, grades and ratings.

The eventual procurement of sufficient planes to replace those temporarily unserviceable while undergoing repairs, and those required to balance the personnel authorized by the Air Corps Act.

That the remaining 203 vacancies authorized by the Air Corps Act be made available within the next two years for graduates of the Advanced Training School.

The provision of additional flying time for Regular and Reserve pilots on extended active duty with the Regular Army.

The provision of more active and inactive flying time for training Reserve officers and the addition of service-type planes to replace training craft now used by Air Corps Reserves.

The passage of an amendment to the Air Corps Act authorizing the Secretary of War to keep as many Reserve officers on extended active duty for two years as funds and facilities permit.

ADMIRAL MOFFETT OUTLINES REQUIREMENTS OF NAVAL AVIATION

Chief of Bureau of Aeronautics Requests More Men, Money and Planes

NAVAL aviation needs more aircraft, additional personnel and increased appropriations, Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics, Navy Department, stated in his 1930 annual report made public December 12.

Admiral Moffett urged passage of legislation authorizing 125 additional planes to replace those taken from the Naval Air Stations at Coco Solo, Panama Canal Zone, and Pearl Harbor, Honolulu, to outfit cruisers. More men are needed at the fleet air bases at San Diego, Calif., and Hampton Roads, Va. However, at the same time Admiral Moffett recommended reduction of enlisted pilots from thirty to twenty-two per cent of the present officer strength in the belief that a lower percentage would result in greater efficiency. Appropriations of more funds is needed to conduct aeronautical experimentation and research.

Included in the other recommendations in Admiral Moffett's report were:

Passage of additional legislation to increase the previously authorized five-year 1,000-plane building program to 1,125.

Completion of the ZRS-5, second of the new super dirigibles proposed for the Navy Department. (The first airship, the ZRS-4, is now under construction by the Goodyear-Zeppelin Corporation.)

A comprehensive naval building program to provide a fleet up to the maximum limits of the London treaty, including provisions for construction of aircraft carriers and authorization for aircraft complements.

Admiral Moffett reported that the personnel on duty in connection with naval aviation at the end of the fiscal year 1930 was as follows:

	Officers	Enlisted Men	Total
Pilots	614	244	858
Student pilots	184	160	344
Observers	9	0	9
Student observers	0	0	0
Flight orders	45	765	811
Non-fliers	167	9,599	9,766
Total	1,019	10,769	11,788

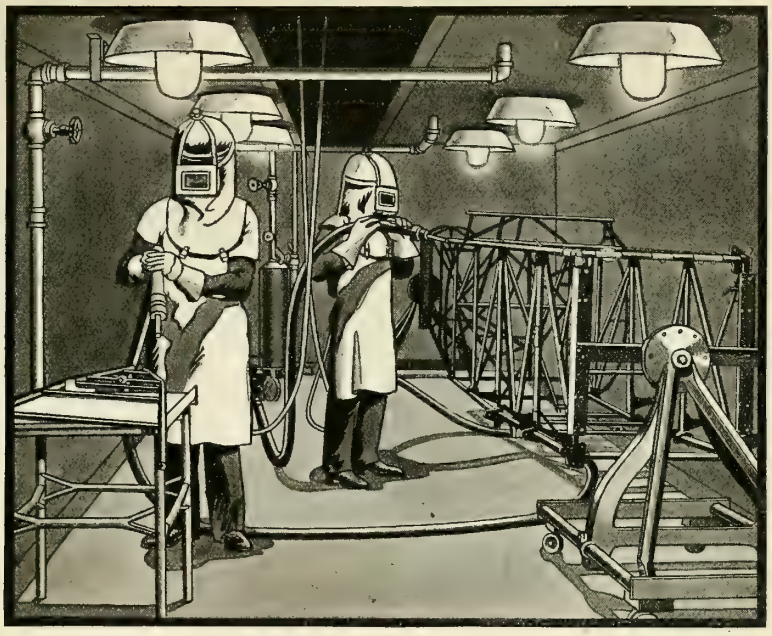
At the close of the fiscal year of 1930 the personnel on duty in connection with Marine Corps aviation was as follows:

	Officers	Enlisted Men	Total
Pilots	82	24	106
Student pilots	28	12	40
Observers	0	0	0
Student observers	0	0	0
Flight orders	7	157	164
Non-fliers	10	955	965
Total	127	1,148	1,275

	Reg. Naval Navy	Res.	Reg. Mar.	Res.	T.
Officers:					
Naval aviators	3	3	3	2	11
Students	*2	0	0	0	2
Non-aviators	0	0	1	0	1
Enlisted men:					
Aviation pilots	1	0	0	0	1
Students	0	0	1	0	1
Flight orders	0	0	1	1	2
Total	*6	3	6	3	18

Fatalities for fiscal year 1929-1930 were:
*Includes Brazilian naval officer undergoing flight training.

Fatalities	18
Fatal accidents	14
Hours per fatality (heavier-than-air)	14,710
Hours per fatal accident (heavier-than-air)	18,913
Total flying time	266,990.00
Hours per fatality (total)	14,832
Hours per fatal accident (total)	19,070



BUILDING CHANCE VOUGHT STAMINA INTO AIRPLANES

Metal parts on Chance Vought airplanes hold their finish. No landings in rough salt water—no dives through soaking clouds of rain—no penetrating fogs break through to start corrosion. Perched high on the exposed decks of Navy ships at sea, Vought planes are well protected against the lash of wind-blown spray.

Before the three protective coats of red oxide and enamel go on, the metal parts are cleaned and surfaced in the sandblasting room. Clouds of fine, sharp grains with a lusty pressure of air behind them remove every vestige of dirt and grease, producing a surface to which the finish hangs on through the toughest kind of service.

In the modern, sunlit Vought plant at East Hartford, you'll find the latest equipment and processes. And you will discover many ingenious methods and mechanisms which are as characteristically Vought as the ships themselves. Chance Vought Corporation, East Hartford, Connecticut. Division of United Aircraft & Transport Corporation.



CHANCE VOUGHT CORPORATION

AERONAUTICAL INDUSTRY

CONFERENCE ON UNIFORM AIR LAWS

THAT there is a definite need for uniform state legislation to aid and promote aeronautics in the United States was generally agreed by delegates from thirty-six states and territories in attendance at the National Conference on Uniform Aeronautic Regulatory Laws, Washington, D. C., December 16-17. It was suggested that all states adopt Federal air traffic regulations and institute local enforcement at least until such legislation is declared invalid and unconstitutional.

The principal accomplishments of the conference, according to Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, were the "crystallization of thought" upon uniform legislation and "an interchange of ideas as to methods of accomplishing uniformity."

"The conference, preceding the sessions of many state legislatures," Colonel Young declared, "provided a chance for many delegates to take home such constructive thoughts and impressions as they might gather for the benefit of their legislatures."

Colonel Young presided at all of the sessions of the conference.

The program included discussion of five fundamental subjects as follows: Uniform basic regulatory state air laws; adoption of Federal air traffic rules by the states for the purposes of local enforcement; methods of local enforcement; state enabling acts for airport acquisition and control; and importance of uniform airport field rules.

Principal interest was shown in the matter of regulation and enforcement. There was a definite belief expressed that local enforcement of air traffic rules is necessary, Colonel Young asserted. However, legal phases of the legislative question must be worked out in the several states.

Application and enforcement of Federal air traffic rules regulating the character of flying, which are enforced at present by inspectors of the Aeronautics Branch, Department of Commerce, was discussed. In addition to the legal phases of enforcement, practical means of policing the air were taken up. The aid of the states in enforcing Federal air traffic rules is required by the Department of Commerce, Colonel Young said, but to date the most effective means of assisting Federal inspectors has not been agreed upon.

The situation affecting acts which would authorize municipalities to acquire and operate airports was not so involved as to require extended discussion, Colonel Young declared. Discussion of passage of enabling acts under which states can acquire and operate airports brought up problems of air rights over adjacent territory, zoning of neighborhoods in which landing fields are located and the degree of liability of municipalities operating airports. The Sample Enabling Act of the Department of Commerce was outlined by Colonel Young.

On December 17 the conference dispatched a telegram expressing congratulations and best wishes to Orville Wright, on the occasion of the twenty-seventh anniversary of "your realization of man's dream of the conquest of the air." The message to Mr. Wright stated that the sole purpose of the conference and of the delegates in attendance was to further aeronautical development "by regulation, not to retard it."

When the conference had assembled after the registration of delegates and others in attendance on the morning of December 16, Robert P. Lamont, Secretary of Commerce, gave the address of welcome. Response to Mr. Lamont was made by State Senator J. Griswold Webb, chairman, New York State Aviation Commission. Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, explained the purpose of the conference. Colonel Young was followed by William Butterworth, president of the Chamber of Commerce of the United States, who discussed the importance of uniform aeronautic regulatory laws to American commerce and industry. The importance of uniform aeronautic regulatory laws to the aircraft industry was discussed by Frederick B. Rentschler, president of the Aeronautical Chamber of Commerce of America, Inc. William P. MacCracken, Jr., formerly Assistant Secretary of Commerce for Aeronautics, addressed the conference on the special problems of aeronautic legislation. The program of the National Aeronautic Association as related to uniformity in aeronautic legislation was the subject of an address given by Senator Hiram Bingham, president of the National Aeronautic Association. In the afternoon a round-table discussion of the subjects presented during the morning session was held.

The conference was opened on the morning of December 17 with an address by Lester D. Seymour, vice president and general manager of National Air Transport. Mr. Seymour discussed aeronautic regulation and enforcement as viewed by the aircraft manufacturer and operator. The problems of local enforcement of uniform air traffic rules were presented by Clarence M. Knox, Commissioner of Aviation, State of Connecticut. John M. Vorys, Director, Ohio State Bureau of Aeronautics, spoke on the methods of local enforcement of uniform air traffic rules. The legal phases of local enforcement of uniform air traffic rules were presented by George B. Logan, member, American Bar Association Committee on Aeronautics. Richard B. Barnitz, Director



Group of delegates and observers who were in attendance at the National Conference on Uniform Aeronautic Regulatory Laws

of Airports, City of Los Angeles, Calif., discussed the importance of suitable enabling acts and uniform airport field rules.

The delegates then left the conference to go to the White House where they were received by President Hoover.

The afternoon session on December 17 was devoted to a round-table discussion of the subjects introduced during the morning session, and the special problems facing the aircraft industry, presented by F. G.. Coburn, president of The Aviation Corporation.

OFFICIAL DELEGATES PRESENT

Adams, Porter ..... N. A. A.
Allen, Conway ..... Louisiana
Arnett, Dr. A. C. ..... Indiana
Ashbridge, Maj. Donald M. ..... Philippines
Barber, Anzi G. ..... Alabama
Barnitz, Richard B. ..... California
Bell, Luther ..... A. C. C.
Beretta, Jack ..... Texas
Berry, Maj. John ..... A. C. C.
Bingham, Senator Hiram ..... N. A. A.
Blee, Harry H. ..... Aeronautics Br.
Borden, William S. ..... New Jersey
Boutelle, R. S. ..... Tennessee
Brady, Hon. Peter J. ..... New York
Brainard, Maj. E. H. ..... A. C. C.
Brattain, Paul ..... A. C. C.
Brooks, Capt. A. C. ..... West Virginia
Budwig, Gilbert G. ..... Aeronautics Br.
Bullard, W. Irving ..... U. S. C. of C.
Chambers, Reed M. ..... A. C. C.
Coburn, F. G. .....
Cordova-Davila, Judge Felix ..... Porto Rico
Cons, Major J. Carroll ..... Arkansas
Cook, H. Weir ..... Indiana
Cooper, John C. ..... Florida
Copsey, Capt. R. L. ..... New Jersey
Cumains, Hon. J. Wm. ..... West Virginia
Cuthell, Chester W. ..... A. C. C.
Davis, State Sen. Manvel H. ..... Missouri
Davison, Maj. D. A. ..... Dist. of Col.
Evans, E. S. ..... Michigan
Finch, Harry L. ..... Utah
Garland, Robert ..... Oklahoma
Gray, J. ..... Georgia
Halley, Walter F. ..... S. Dakota
Harding, Hon. Fay ..... North Dakota
Harrelson, J. W. ..... North Carolina
Hayes, James M. Jr. ..... Virginia
Hingsburg, F. S. ..... Aeronautics Br.
Hinshaw, H. ..... A. C. C.
Hitchcock, Frank ..... Arizona
Horner, Leonard S. ..... Connecticut
Hughes, L. W. ..... Tennessee
Hurst, Ralph E. ..... Alabama
Johnson, Earle L. ..... Ohio
Kintz, Elmer McD. ..... Aeronautics Br.
Klug, Norman R. ..... Wisconsin
Knottz, Capt. Howard ..... Illinois
Knox, Capt. Clarence M. ..... Connecticut
Kremlick, Kurt J. ..... Michigan
Lamont, Robert P. ..... Secretary of Com.
Landis, Maj. Reed ..... Illinois
Leavell, John ..... Oklahoma
Lewis, Dr. George W. ..... N. A. A.
Logan, George. B. ..... Missouri
McGonagle, George F. ..... Utah
MacCracken, Wm. P. Jr. ..... A. C. C.
Madden, Jas. L. ..... U. S. Chamber of Com.
Masson, Capt. Charles A. ..... Maryland
Mayo, W. B. ..... Michigan
Moore, Robert M. Jr. ..... N. A. A.
Moyne, Sen. George G. ..... Massachusetts
Neely, Frederick R. ..... Aeronautics Br.
Parker, Capt. George A. ..... Massachusetts
Paulett, Richard S. ..... Aeronautics Br.
Payson, Phillips M. ..... Maine
Pierce, Hon. Charles T. ..... Vermont
Pitcairn, Harold ..... Aero. Chamber of Com.
Ramsey, Lt. Com. Dewitt ..... Maryland
Rand, Rufus R. Jr. ..... Minnesota
Rodey, Pearce ..... New Mexico
Schmiege, Oscar ..... Wisconsin
Seymour, Lester D. .....
Spear, Arthur G. ..... Maine
Slater, Harry G. ..... Wisconsin
Turner, Ellwood J. ..... Pennsylvania
Vorys, John M. ..... Ohio
Waymack, W. W. ..... Iowa
Webb, Hon. J. Griswold ..... New York
Whitaker, R. A. ..... Louisiana
White, Rush J. ..... Idaho
Willebrandt, Mrs. Mabel W. .....
Williams, Lawrence E. ..... Dist. of Col.
Wood, J. D. ..... Idaho
Yorkson, Lee I. ..... Wisconsin
Young, Clarence M. ..... Asst. Sec'y of Com.
Young, W. C. ..... U. S. Chamber of Com.

OFFICIAL OBSERVERS PRESENT

Aldrin, Capt. Edwin R. ..... New York
Barber, Col. A. B. ..... U. S. Chamber of Com.
Dutton, Capt. George P. ..... New York
Egge, Carl F. ..... Ohio
Ervin, Maj. R. G. ..... New York
Fagg, Prof. Fred D. ..... Illinois
Fess, Lehr ..... Ohio
Findley, Earl ..... Washington, D. C.
Hanks, Stedman ..... Massachusetts
Hawks, Capt. Frank M. ..... New York
Jones, C. S. ..... New York
Kremlick, Kurt J. ..... Michigan
Poe, Edgar Allen, Jr. ..... Maryland
Stewart, A. T. ..... U. S. Chamber of Com.
Warner, Edward P. ..... New York
Wikoff, Howard H. ..... Illinois
Williams, Alford J. ..... New York

OBSERVERS PRESENT

Altick, Capt. Sherman B. ..... N. Y. Sun
Bennett, H. C. ..... Aero. Chamber of Com.
Bennion, Howard S. .. Natl. Electric Light Assn.
Bogert, Geo. G. Nat. Conf. Com. on Uniform Laws
Carter, Geo. N. ..... Idaho
Charles, Chester A. ..... Aero. Br.
Childs, Randolph W. ..... Pitcairn-Cierva Co.
Cowen, Mrs. M. M. ..... Oregon
Cromelon, Julien T. ..... D. C.
Crosthwait, Stanley D. ..... Aero Br.
Davis, W. Jefferson ..... Comm. on Aero. Law
Dion, Chas. S. ..... New Jersey
Dixon, Chorrelis ..... Internatl. Seed Serv.
Duer, J. V. B. ..... Penna. Railroad
Earhart, Amelia ..... New York
Evans, Silliman ..... S. A. F. E.
Ford, Edwin D. Jr. .. Electric Bond & Share Co.
Groves, John ..... Aero Br.
Hartney, Harold E. .. Aviation Business Bureau
Hayden, James J. ..... C. U. Law School
Hildebrandt, T. T. ..... Maryland
Knauth, Arnold W. ..... New York
Lambie, Margaret ..... D. C.
Letson, W. A. ..... U. S. Airways
Link, Walter ..... Amer. Airship Assn.
Loeb, Jesse ..... D. C.
Lyman, L. A. ..... N. Y. Times
McCain, W. E. .....Fed. Traffic Bd.
McDonald, H. Stewart Jr. ..... Aero C. of C.
Mirkil, Hazleton ..... Pa. Bar Assn.
Morse, Walter L. ..... Amer. Railway Assn.
Nelson, 1st Lt. V. E. ..... New York
O'Brien, Robert L. ..... Massachusetts
Pattison, Ethel Ely ..... Internatl. Seed Serv.
Peat, D. Barr ..... Issoudun Airport
Reppy, Alison ..... Air Law Review
Robinson, Lt. Chas. McK. ..... Air Corps
Rowe, Charles E. ..... D. C.
Sommers, J. E. ..... Aero Br.
Stowell, Thomas C. .... N. Y. State Aviation Com.
Taliaferro, A. P., Jr. ..... Aero Br.
Tichenor, Frank A., publisher ..... AERO DIGEST
Whitlock, Victor.....U. S. Daily
Williford, I. ..... Mississippi
Wilson, Gill Robt. .....New Jersey
Worder, Clarence ..... Majors Committee

The Sportsman Pilot Now Published by Frank A. Tichenor

BEGINNING with the December issue, *The Sportsman Pilot* will be published by Mr. Frank A. Tichenor, publisher of AERO DIGEST. *The Sportsman Pilot*, established seventeen months ago, is the only class magazine in the field of aviation. It is devoted to the interests of sport flying and designed as a medium for reaching the layman whose attention is drawn to the science of aeronautics as a fascinating hobby. The magazine is published monthly.



held at Washington, D. C., December 16-17, under the auspices of the Aeronautics Branch, Department of Commerce

DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

(Japan.) The Hon. Mrs. Victor Bruce landed at the Tachikawa airport, Tokio, completing a 13,000-mile solo flight which started at London, England, September 25. She made the journey in the biplane *Bluebird.* (Nov. 24)

(France.) International Aero Show was held at the Grand Palais, Paris, auspices Chambre Syndicale des Industries Aeronautiques. (Nov. 28-Dec. 14)

Fifty-first annual meeting of the American Society of Mechanical Engineers was held in the Engineering Societies Building, New York, N. Y. (Dec. 1-5)

Miss Ruth Nichols landed at United Airport, Burbank, Calif., completing a flight from Roosevelt Field, L. I., and setting a new women's East-West coast-to-coast record of 16 hours, 59 minutes and 30 seconds flying time. Her time lowered by 8 hours, 44 minutes and 30 seconds the record set recently by Mrs. Keith Miller. Over-night stops were made at Columbus, Ohio; Wichita, Kan.; Amarillo, Texas; and Kingman, Ariz. Miss Nicholas used *The New Cincinnati,* the Wasp-powered Lockheed Vega radio plane of the Crosley Radio Corporation. (Dec. 1)

A coöperative agreement whereby schedules will be coördinated was announced by Eastern Air Transport, Inc., and American Airways, Inc., of which Colonial Airways and Southern Air Fast Express are divisions. Under the terms of the agreement, an advantageous air mail and passenger schedule from Montreal, Canada, extending through Atlanta, Ga., to Los Angeles, Calif., will be effected. (Dec. 3)

The Herbert Schiff Trophy, awarded annually to the Naval Aviation Squadron which flies the greatest number of hours without accident, was presented by President Hoover at the White House, Washington, D. C., to Lieut.-Comdr. Samuel Paul Ginder for Squadron 3-B of the Aircraft Carrier *Lexington.* (Dec. 5)

Five members of the Shippe-Johnson Peruvian Expedition sailed from New York, N. Y., for Lima, Peru. The expedition, equipped with two Bellanca cabin monoplanes, plans to explore Peru from the air. (Dec. 5)

The monoplane cabin glider *Eaglet,* in which Capt. Frank M. Hawks last April completed a transcontinental flight from San Diego, Calif., to New York, N. Y., towed by the *Texaco No. 7,* a Waco biplane piloted by J. D. "Duke" Jernigin, Jr., was formally presented to the Smithsonian Institution during ceremonies at Bolling Field, Washington, D. C. Dr. C. G. Abbot, secretary of the Smithsonian, accepted the gift from Frank A. Tichenor, publisher of AERO DIGEST, and representatives of the Texas Company, owners of the glider. (Dec. 8)

A new naval air policy which emphasizes that naval aviation activities are functions of the fleet rather than as those of coast defense was announced by Admiral William V. Pratt, chief of naval operations. The policy, effective April 1, 1931, shifts the Naval Air Stations at Coco Solo, C. Z., and Pearl Harbor, Honolulu, to the direct command of the fleet. (Dec. 8)

Construction of a 13,800-ton aircraft carrier, a 10,000-ton "flying-deck" cruiser and 130 aircraft for surface ships built or being built were among the provisions for naval aviation included in a bill authorizing an appropriation of $134,635,000 for a naval building program introduced in the House by Representative Britten. (Dec. 8)

The fastest flight ever made between Washington, D. C., and New York, N. Y., was completed by Capt. Frank M. Hawks. Flying the Travel Air Mystery S. *Texaco 13,* Captain Hawks flew from Bolling Field to Curtiss Airport, Valley Stream, L. I., in 58 minutes at a speed of 228 miles per hour, or 3.79 miles per minute. (Dec. 9)

A new West-East coast-to-coast record for women of 13 hours and 22 minutes flying time was set by Miss Ruth Nichols on a one-stop flight from Los Angeles, Calif., to Roosevelt Field, L. I. This record exceeded by more than one hour that of Colonel and Mrs. Lindbergh made in April, 1930, and was within two hours of the flying time of Capt. Frank M. Hawks who holds the record. Making an over-night stop at Wichita, Kan., Miss Nichols completed the journey in a total elapsed time of 29 hours, one minute and 43 seconds. (Dec. 9)

(France.) International Congress of Aerial Security was held at Paris. (Dec. 10-23)

That there is a definite need for uniform state legislation to aid and promote aeronautics in the United States was generally agreed by delegates from thirty-six states and territories in attendance at the National Conference on Uniform Aeronautic Regulatory Laws held at Washington, D. C. (Dec. 16-17)

(Italy).) Fourteen flying boats left Ortebelle on a projected trans-Atlantic flight to Brazil (Dec. 17).

(France.) Entries closed for the International Tests for Silk Parachutes, auspices French Ministry of War, Paris. (Dec. 31)

(England.) Entries closed for the Schneider Trophy Race of 1931. (Dec. 31)

Dr. Cooper Appointed Medical Director of Aeronautics Branch

DR. HAROLD J. COOPER has been appointed medical director of the Aeronautics Branch of the Department of Commerce, according to a recent announcement of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics. Dr. Cooper, formerly assistant medical director, succeeds Dr. Louis H. Bauer, resigned. Dr. Eldridge Adams has been appointed assistant medical director, succeeding Dr. Cooper.

Postpone Licensing of Gliders Under New Rules Until July 1

GLIDERS will be licensed by the Aeronautics Branch of the Department of Commerce under three classifications beginning July 1, according to a recent announcement of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics. This date has been extended from January 1 because there are innumerable gliders throughout the United States in various stages of construction which will not be completed by that date. In addition, there are a number of glider manufacturers who have not obtained Approved Type Certificates for their products.

The new method of licensing gliders was reported in the July, 1930 issue of AERO DIGEST.

Graduates of Approved Flying Schools Found Superior in Aero Branch Survey

GRADUATES of approved flying schools surpass other applicants for Department of Commerce pilots' licenses, according to a recent announcement of the Aeronautics Branch. During the first six months of 1930, 92.66 per cent of the applicants from flying schools approved by the Department of Commerce were successful in meeting the requirements for Federal licenses. This is in comparison with applicants not trained in such approved schools, 67.34 per cent of these applicants being successful in the tests involved.

Coincident with the completion of the survey there were thirty-eight schools on the approved list. The first schools received their ratings July 15, 1929. More than half of the total number were approved since January 1, 1930.

Complete Airship Mooring Mast on New York Skyscraper Building

CONSTRUCTION of a 205-foot dirigible mooring mast which forms the pinnacle of the new eighty-five-story Empire State Building, New York, N. Y., has been announced by the builders, Starrett Brothers and Eken, Inc. The mast is square in shape with the exception of the section nearest the top which is in the form of an octagon. It is designed to withstand an airship pull of 10,000 pounds. Each of the four main steel columns in the mast is designed to withstand an upward pull of 400,000 pounds. Machinery for anchoring airships will be erected at the top of the mast.

Cleveland, Ohio, to be Scene of National Air Races for Next Ten Years

AN agreement whereby Cleveland, Ohio, will be the scene of the National Air Races for the next ten years provided Cleveland is able to satisfy the contest committee of the N.A.A. of its ability to fulfill the conditions upon which the annual sanction of the event is based, was announced December 22 by Senator Hiram Bingham, president of the National Aeronautic Association.

The agreement has been effected between the N.A.A. and the Cleveland Chamber of Commerce, National Air Races of Cleveland, Inc., Cleveland Chapter of the N.A.A. and the City of Cleveland.

It is believed by the contest committee of the N.A.A. that the establishment of a permanent home for the National Air Races will result in a more efficient and economical administration of the races; a more effective control of and improvement in the race program; and in improved permanent accommodations and facilities for the convenience of the public, participants and the press.

EXPORT OF AIRCRAFT ENGINES AND PARTS SHOWS INCREASE

Total Foreign Aeronautical Shipments in First Nine Months of 1930 Decrease Five Per Cent

EXPORTS of aeronautical products during the first nine months of 1930 decreased five per cent as compared with the same period in 1929, according to a report issued by Leighton W. Rogers, Chief of the Aeronautics Trade Division, Department of Commerce. This is in comparison with the total exports of all American products which decreased twenty-five per cent during this period in 1930 over the first nine months of the previous year. Exports of aircraft engines and parts showed an increase as compared with the 1929 period.

The percentage of aircraft shipped to countries in Central and South America during the first nine months of 1930 increased over the same period in 1929. The activity of airlines in South and Central America incurred procurement of aircraft from the United States last year, exports of aircraft to these countries amounting to fifty-four per cent of the 1930 total as compared with thirty-eight per cent of the whole for 1929.

"One of the most important factors in the favorable position of our export trade in aeronautics products," Mr. Rogers said, "is the fact that airworthiness certificates for export issued by the Aeronautics Branch and involving the rigid inspection of the branch are now available on all over-seas shipments."

The value of exports of aircraft, engines and parts from the United States during the 1930 period covered in the report totaled $6,783,123, as compared with $7,130,916 for the same period in 1929. There were 251 completed aircraft valued at $3,740,082 exported up to October 1, 1930. In 1929, 275 planes valued at $4,397,311 were exported in a similar period.

Exports of aircraft engines during the first nine months of 1930 totaled 294 with a valuation of $1,289,343, an increase over the same period in 1929, when these exports totaled 265 and had a value of $1,127,090. Parts exported for the first nine months of 1930 had a total value of $1,753,698, as compared with $1,606,515 for the same period in 1929. Complete aircraft were shipped to nineteen countries; aircraft engines to thirty-one, and parts to fifty-six.

Announce Examinations for Airways Radio Operators

OPEN competitive examinations for assistant radio operator (airways) and junior radio operator (airways) have been announced by the United States Civil Service Commission. These examinations will be made to fill vacancies in the Bureau of Lighthouses, Department of Commerce. Applications must be on file with the commission at Washington, D. C., not later than January 14.

Full information may be obtained from the United States Civil Service Commission, Washington, D. C.; the U. S. Civil Service Board of Examiners; or from the postoffice or customhouse in any city.

Open competitive examinations for Junior Engineer have been announced by the United States Civil Service Commission. Applications must be on file with the U. S. Civil Service Commission at Washington, D. C., not later than February 10. This examination is to fill vacancies in various services for duty in Washington, D. C., or in the field, and will consist of questions in the branch of engineering selected by the applicant and on other subjects pertaining thereto.

ESTIMATED GASOLINE AND OIL CONSUMPTION BY COMMERCIAL AIRCRAFT FOR CALENDAR YEARS 1926, 1927, 1928, 1929 AND FIRST SIX MONTHS OF 1930

Scheduled Air Transport Operations

	1926	1927	1928	1929	Jan.-June 1930
Airplane Miles Flown	4,318,087	5,870,489	10,673,450	25,141,490	16,902,728
Gasoline Consumption (gal.) (a)	863,617	1,174,098	2,134,690	6,285,374	6,218,271(b)
Oil Consumption (gal.) (a)	43,181	58,705	106,735	314,268	202,249

Miscellaneous Operations (c)

	1926	1927	1928	1929	Jan.-June 1930
Airplane Miles Flown (a)	18,746,640	30,000,000	60,000,000	110,000,000	51,767,200
Gasoline Consumption (gal.) (a)	2,426,028	3,882,351	7,764,702	14,235,243	6,669,261
Oil Consumption (gal.) (a)	121,301	194,118	388,235	711,762	334,963

Total For All Operations

	1926	1927	1928	1929	Jan.-June 1930
Airplane Miles Flown	23,064,727	35,870,489	70,673,450	135,141,499	68,669,928
Gasoline Consumption (gal.) (a)	3,289,645	5,056,449	9,899,392	20,520,617	12,887,532
Oil Consumption (gal.) (a)	164,462	252,823	494,970	1,026,030	537,212

(a) Estimate based on reports from operators.
(b) Due to the general use of larger aircraft with increased horsepower by scheduled operators, the consumption of gasoline per mile flown has greatly increased.
(c) Miscellaneous flying includes such operations as experimental, exhibition, industrial, student instruction and pleasure flying.

COMING AERONAUTICAL EVENTS

December 31. Entries close for the International Tests for Silk Parachutes, auspices French Ministry of War, Paris, France.

January 8-10. Third Annual Miami All-American Air Races and Navy Field Dedication, Miami Municipal Airport, Miami, Fla.

January 11-February 1. Second Annual All-Florida Air Tour, auspices Florida State Chamber of Commerce, starting at Miami and ending at Tampa.

February 1-20. First Pan-American Aeronautical Conference, Montevideo, Uruguay.

March 25-27. Third National Airport Conference, Mayo Hotel, Tulsa, Okla.

April 11-19. International Aircraft Show, Detroit, Mich., sponsored by Aeronautical Chamber of Commerce and Aircraft Bureau, Detroit Board of Commerce.

May 15-31. International Aero Exhibition, Stockholm, Sweden.

May—Annual maneuvers of Army Air Corps along Atlantic Seaboard.

August 23-Sept. 1. Tentative date of National Air Races, Cleveland, Ohio.

Pratt and Whitney Announce Personnel Changes in Organization

BENJAMIN H. GILPIN, service manager of the Pratt and Whitney Aircraft Company, East Hartford, Conn., has been appointed factory manager, according to Don L. Brown, president. T. E. Tillinghast, executive engineer, was elected a director of the company and will have charge of all outside engineering activities under A. V. D. Willgoos, chief engineer, who heads the engineering staff. While succeeding Mr. Brown as factory manager, Mr. Gilpin will retain his duties as service manager. J. L. Bunce of the service department has been appointed assistant service manager.

Other promotions included the appointment of Arthur Brooksbank as assistant to Andrew Hart, auditor, who has been put in charge of all accounting activities. R. Dimery has been appointed factory accountant succeeding Mr. Brooksbank, who will also continue as office manager.

AT a meeting of the board of directors of the Sikorsky Aviation Corporation, reecntly held in the offices of the United Aircraft and Transport Corporation, New York, N. Y., F. B. Rentschler was elected chairman of the board to succeed A. C. Dickinson, who has resigned due to ill health.

W. A. Bary, vice president and general manager and a director of the company, has resigned. George S. Wheat, vice president of United Aircraft, was elected a director to fill the vacancy made by the resignation of Mr. Bary.

LIEUT-COMDR. FRED W. NIELSON, U. S. N., resigned, has been appointed sales manager of the Sikorsky Aviation Corporation, Bridgeport, Conn. Mr. Neilson has an eleven-year background in naval aviation.

TRIANGLE SAFETY BELT

THE Triangle Parachute Company of Cincinnati is now making deliveries on an airplane safety belt developed by E. L. Hoffman. Although now being marketed for the first time, this belt is not new nor experimental. It has successfully passed many tests and has been used in actual service.

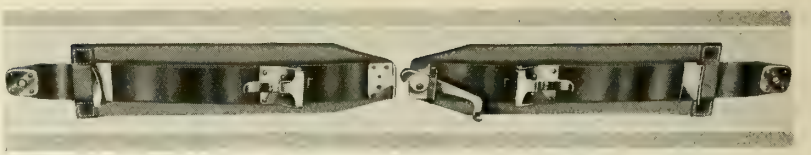
The belt proper is made of spring phosphor bronze backed with wide buffers of cowhide leather. All metal parts are stainless and non-corrosive. A removable linen cover, which can be laundered as often as necessary, affords protection to the clothing of the wearer.

The design of the Hoffman Triangle Safety Belt is such that the phosphor bronze strips take all of the strain. The leather buffers are merely for the comfort of the wearer.

The belt consists of two halves, one of which is fastened to each side of the seat. Being of semi-rigid construction and having a rigid mounting to the seat, the two halves of the belt are pushed upward and out of the way when not in use.

When the passenger sits down, he reaches around, grasps the two halves and pulls them forward and together. The ends are brought together and latched by pushing down on the releasing lever. The wearer then pushes down on the patented adjusting pieces, one on each side, ratcheting the belt to any tightness desired.

Should the belt become opened accidentally, the wearer is instantly warned by the two parts of the belt springing outward, hitting him on the arms. The release lever is easy to locate, and a slight pull opens it instantly when necessary.



Airplane safety belt made by Triangle Parachute Company, Cincinnati, Ohio

Aeronautic Session Held During Annual A. S. M. E. Meeting

DURING the Annual Meeting of the American Society of Mechanical Engineers in New York, December 1-5, one session was held under the auspices of the aeronautic division of the Society. E. E. Aldrin, manager of the aviation department of the Standard Oil Company of New Jersey, and member of the executive committee of the aeronautic division of the Society, presided.

The report of the A. S. M. E. special research committee on airplane vibration with special reference to instruments was presented by F. K. Teichmann, instructor at the Daniel Guggenheim School of Aeronautics, New York University. J. F. Hardecker, chief draftsman of the Naval Aircraft Factory, and Pierre Freyss, F. Schumacher and Company, submitted a paper on airplane cabin engineering. Mr. Freyss, in his section of the paper, covered cabin design from the esthetic standpoint and described fabrics employed for the walls and chairs.

Among those who discussed these papers was J. K. Wood, consulting engineer and an authority on the design of mechanical springs. Among other things he suggested that experiments now being carried on by Dr. Moss in testing the fatigue of passengers riding in automobiles and motor buses be applied to airplane passengers to determine speed limits.

The progress report of the aeronautic division, which was to have been presented by C. H. Colvin, president of the Pioneer Instrument Company, was read in his absence by Professor A. Klemin of the Daniel Guggenheim School of Aeronautics, New York University.

The following were the authors of this report: W. H. Miller, B/J Aircraft Corporation; Richard Mock, Ernst Heinkel Flugzeugwerke, Germany; A. Black, Black and Bigelow; Rear Admiral Wm. A. Moffet, U. S. N., Chief of the Bureau of Aeronautics; Lieut. S. P. Mills, materiel division, Air Corps.; C. P. Burgess, Bureau of Aeronautics, and F. C. Hingsburg, Airways Division, Department of Commerce.

PURCHASE of the entire assets of Kari-Keen Aircraft, Inc., Sioux City, Iowa, has been announced by the Sioux Aircraft Corporation, Sioux City. The company has started production of the Kari-Keen 90. Merle F. Cornell will continue as general manager of the factory. National Aircraft Engineers, formerly Gazley and LaSha, have been retained as consulting engineers.

FIBRE-TITE Cornstalk Plastic, a product made of cornstalks, has been developed and is being distributed by the Fibre-Tite Company, Ames, Iowa, for use in the aviation and other industries. This product is being used by aircraft manufacturers, according to the company, to reinforce and streamline planes. It can be moulded into any shape desired and has been developed as a substitute for wood; nails can be used in its use; it can be planed, sawed or cut; and its surface painted, varnished or polished.

NEW YORK

To Propose Federal License for Every Plane Flown in New York State

A BILL requiring a Federal license for every airplane flown in the State of New York, whether engaged in interstate commerce or not, is to be submitted to the State Legislature in January, according to a recent announcement of the State Aviation Commission. Under present legislation, licenses are required only for aircraft engaged in interstate commerce.

AMONG those invited to address the First International Congress of Aerial Security, Paris, France, December 10-23, was E. E. Aldrin, aviation manager of the Standard Oil Company of New Jersey and vice president of the Stanavo Specification Board, Inc. Mr. Aldrin was unable to attend and his paper, entitled "Safe Handling of Aviation Fuel," was presented to the congress by Mr. Gordon of L'Economique.

JAMES A. DUNNE has been appointed manager of the aircraft division of the United States Plywood Company, New York, N. Y. Mr. Dunne was formerly Eastern representative of the Haskelite Manufacturing Corporation. The United company will introduce on the market an aircraft plywood manufactured by a new process under the trade name of Weldwood.

SEABOARD AIRCRAFT CORPORATION, Hangar D, Roosevelt Field, L. I., announce that there are in storage and for service in the company's hangar four of the largest planes in the United States as follows: thirty-two passenger Fokker F-32; Sikorsky S-37, a twenty-passenger ship; Uppercu-Burnelli, a twenty-four passenger plane; and an eighteen-passenger Curtiss Condor. All of these ships are active in general flying and demonstration work. In addition, there are eight smaller planes in active storage.

THE Binghamton Airport Company, Binghamton, N. Y., has announced the acquisition of the former Watrous Airport and has named the field the Binghamton Airport. The field is one-half mile by three-fourths of a mile and is four miles from Binghamton. A hangar which will accommodate ten planes has been constructed at the field.

CENTRAL NEW YORK

[M. MARVIN]

A FLYING class with seven members was recently organized by Bill Wademan. A Waco 10, powered with an OX-5 engine, will be used for student instruction.

THE first ground school in Auburn was recently organized by aviation enthusiasts under the auspices of the Y. M. C. A. The course will consist of both a mechanics' and a ground course. Classes will be held two nights a week for a period of twenty weeks. At the completion of the course, an instructor will be employed to give flying lessons.

NEW JERSEY

THREE aviation concerns flying air mail to the port at Newark are dividing the cost of a building which is under construction on the Newark field. The cost will be $35,000, and the building will be a two-story air mail postoffice building. The structure will be located on the northeast corner of the field. The postoffice will occupy the entire ground floor.

BUSINESS at Newark Airport for October resulted in a total revenue of $6,069.51. Hangar storage brought $1,086.50; passenger business, $996; leases, $750; local sight-seeing flights, $45; parking charges, $263; hangar rental, $678; percentage on gasoline and oil sales, $869.27; repairs to aircraft, $129.01; and percentage on air express business, $928.

MARYLAND

[E. WALSH]

THE Curtiss-Wright Flying Service at Baltimore, Md., has offered to give its standard ground course to the public free of charge "in order to promote a more general public understanding of aviation and its uses." One session each week is to be held at the Curtiss-Wright Airport, where a lecture hall seating one hundred persons is available.

REGULATIONS embodying stringent rules for the control of airplanes, gliders and parachute jumpers in Maryland, have been put into effect by the Maryland State Aviation Commission.

PENNSYLVANIA

THE Hamilton Standard Propeller Company, Pittsburgh, Pa., will enter a Sikorsky S-39 five-place amphibion in the special race for amphibions included in the program of events at the Third Miami All-American Air Races, Miami, Fla., January 8-10. The plane will be equipped with the new controllable pitch propeller made by the Hamilton company. George Meissner will pilot the plane in the race. The plane will be entered in the Florida State Air Tour after the Miami races.

[B. F. PRYOR]

THE Scranton Condon Gliding Club has placed an order for a Franklin P-S 2 utility glider, manufactured by the Franklin Glider Corporation of Ypsilanti, Michigan. Delivery is to be made as soon as possible.

The Condor Club has thirty members. Walter Marsh is president; George Lohman, vice president; Stephen Chris, secretary; and John O'Malley, treasurer.

THE Moscow Airport has built a hangar capable of housing eight large or twelve small planes. The field is located between Moscow and Daleville, Pa., between the Lackawanna Trail and the D. L. & W. main line. The field covers eighty acres of naturally drained land and has runways in all directions.

PHILADELPHIA

[R. GARD]

WORK on the Hog Island air-rail-marine terminal is expected to get under way soon. The work will give employment to four hundred men, according to a recent announcement.

COMMANDER RALPH D. WEYERBACHER, head of the Naval Aircraft Factory at the Philadelphia Navy Yard, was recently transferred to the materiel section of the Bureau of Aeronautics. He will superintend the design and development of aircraft engines, radio equipment, and lighter-than-air craft and deal with technical problems.

INTEREST in gliding continues in Philadelphia. At Wingsport, the field of the Wings Corporation, local Waco distributors, new students are continuing to show up in increasing numbers. Wingsport is the only field in the Philadelphia area at which gliding instruction is given. Waco gliders are used for instruction purposes.

PITTSBURGH

[BOB COATES]

WORK on the runways at the new municipal airport got under way when road crews, laborers, truck and tractor drivers set to work recently. More than 150 men, employees of the Allegheny County roads department, started the work. It is planned eventually to employ 350 men. High grade macadam will be used to surface the runways.

THE Wilkinsburg airport is the latest in the Greater Pittsburgh district. The new field is on the William Penn Highway, on Graham Boulevard. Five ships are being maintained at the port. Post 305, American Legion, sponsored recent formal dedicatory exercises.

OHIO

[T. E. LUNSFORD]

THE Ohio State University Glider Club has purchased a glider from the Smith Aeronautical Corporation, Middleton. The club has twenty-five members.

INCORPORATION papers have been issued to the S. & Z. Flying Service, Inc., Riceland. The company is authorized to issue 250 shares of no par value stock. The incorporators are Rollin M. Spade, Merle D. Evans, R. G. Zimmerman and F. R. Spade.

THE City Council of Bucyrus has voted to purchase for $10,000 the Peter Metzger farm, a mile south of the city, for a municipal airport.

CONTRACT for the municipal airport terminal building at Akron, Ohio, has been awarded to the following companies: Harbaugh Construction Company, $63,975 for the building; McGowan Plumbing & Heating Co., $10,520 for plumbing and heating; and Akron Motor & Generator Co., $5,904 for electrical fixtures, wiring and equipment. Total cost of the terminal will be $80,399, and the contract specifies April 1 for completion of the structure.

COLUMBUS

[W. DONALD WALTER]

COLUMBUS was represented by a number of ships at the recent dedication of the Cambridge Airport. Among them was a Ford of Transcontinental & Western Air, Inc., the first ship ever sent by this company from Port Columbus to participate in a dedication ceremony. The ships were kept busy all afternoon in hopping passengers.

SINCE the beginning of this fiscal year, sixty different pilots of the Air Corps Reserve have made flights from Norton Field. Most of these men fly regularly. In view of the limited amount and the type of the equipment available for the Reserve at this station, it is felt that this is a most creditable showing. With the exception of a very short period, when an O-11 was assigned to the field, PT1's have been the only airplanes furnished the Reserve Corps. It is now understood that the long-looked-for O2H's will soon materialize.

MICHIGAN

ATTAINMENT of reduced operating costs and improved quality of products have been announced by officials of the Ex-Cell-O Aircraft and Tool Corporation, as the result of increased efficiency since the company took over its new plant facilities in Detroit, Mich. The plant is a one-story type of structure, recommended by the Austin Company, engineers and builders, as the best adapted for the company's manufacturing processes.

APPOINTMENT of Willis C. Brown as sales manager of the Continental Aircraft Engine Company, Detroit, Mich., has been announced by Robert Insley, president of the company. Mr. Brown was formerly president of the Spartan Aircraft Company, Tulsa, Okla., and vice president in charge of sales of the Warner Aircraft Corporation, Detroit.

[J. M. HILL]

CAPT. RAY COLLINS, director of the Michigan Board of Aeronautics since his appointment shortly after the board's organization more than a year ago, has announced his resignation from the post. He is succeeded by Maj. Floyd Evans of the 107th Observation Squadron, Michigan National Guard.

THE City of Detroit has appointed a commission of five prominent men who will endeavor to increase the business at the Detroit Municipal Airport, which cost the city $8,000,000.

A NEW system of reporting landing conditions of airports within the state has been instituted by the Michigan Board of Aeronautics. Through its headquarters at Lansing, the board operates a clearing house for the seventy-one licensed flying fields in the State, which coöperate with the board in making reports of runway repairs, obstruc-

(*Continued on next page*)

(Michigan News continued)

tions, and exceptional landing conditions. Efficiency of the plan is made possible by the system of airport managership which was established recently by the board. Each airport has a manager, designated and licensed by the air board, and he is directly responsible to the board for activities of the port. When a notice is filed with the secretary of the board at Lansing, Louis E. Firsht, the report is immediately broadcast to airports throughout the state.

WISCONSIN

[W. SCOLLARD]

IT is claimed that Milwaukee County is spending too much money in its 1931 budget for development and maintenance of the county airport. The 1931 budget sets aside $211,820.

Of the budget, $27,000 is to go for maintenance and operation; $158,300 for improvements; and $25,800 for additional land. Erection of a new hangar for the Northwest Airways, Inc., to cost $37,800 is contemplated.

DAYTON KIRBY and Norman Deuel of Chippewa Falls have taken over the Wisconsin Aircraft Company and aviation training school from R. C. Olson. Exclusive rights to manufacture the Olson Song Bird, Fly Aire and the new Olson sport planes were given to the new owners by Mr. Olson, who will act as technical adviser for the company. The aviation school will be continued in connection with the factory.

NEBRASKA

[J. R. LOWELL]

FRANK BEREN of Lexington, Neb., who flies an OX-powered Waco, has demonstrated to telephone company officials in Nebraska that the airplane can be a valuable asset to their business. After a recent storm he took a telephone linesman as a passenger and located within an hour a broken pole which had crippled service between two Nebraskan towns. It would have required two days for two men in an automobile to render the same service.

MALCOLM S. SMITH, test pilot for the Lincoln Aircraft Company, is believed to have broken the world's altitude record for light aircraft, piloting a Lincoln AP cabin job powered by a 125-horsepower Kinner engine. Leaving Union Airport at 1:57 p.m., he landed again after an hour and fifty-one minutes, having climbed to an altitude of more than 28,000 feet. Both of his altimeters failed at 21,000 feet.

OMAHA has been designated by the Department of Commerce as inspection headquarters for Nebraska and Colorado. The Omaha office will work under supervision of the Kansas City district office.

THE grading project which has been in progress at Union Airport, Lincoln, has been completed, giving the port natural drainage from all parts of the field.

VOTERS of the city of Omaha nave authorized a five-year $500,000 program for the municipal airport. First improvements will include construction of adequate runways, fencing of the field, and provision of the necessary hangar space.

OMAHA

[C. P. RODMAN]

ENLARGEMENT of the Omaha Municipal Airport by purchasing and developing 250 acres of ground between the present site and the Missouri River is now contemplated. Commissioner Noyes, in charge of city air activities, has the assurance that as soon as grounds are secured to the river the U. S. Government will then match the city dollar for dollar in expenditures. No improvements would be made on the new addition until April. The approximate cost of new improvements is $141,745.

THE University of Omaha is now conducting a course of instruction in aviation. Two lectures each week will be given under the supervision of Donald Halley of the Rapid Aviation Lines.

This course will be open to all students of the University, the Halley organization and general public. Motion pictures will play an important part in the work. Study of engines and proper care will be a part of the class work. Credits will be given by the University.

J. D. GOODRICH of Omaha has received the presidency of the Nebraska chapter of the National Aeronautical Association. He is manager of the Otis Elevator Co., Omaha. Other officers include John McGuirk, vice president; C. E. Goddard, secretary-treasurer; and Joe Lewis, Frank Grace and W. F. Haley, directors.

IOWA

[I. W. MOORHEAD]

JACK M. WALTON, president of the Des Moines chapter of the National Aeronautic Association, has built a club house for the local chapter at Wakonsa Park.

A CONDEMNATION jury in district court has awarded a price of $118,500 for the W. B. Smith and Truman Jones tracts, totaling 240 acres at Southwest Twenty-first street and Army Post road, to be purchased for a municipal airport. This price, which includes damages to tenants on both pieces of property, is $41,500 less than the sum demanded by the owners.

CHARLES W. Gatschet, pilot of *Good News* II, has been commissioned a lieutenant colonel in the Iowa National Guard on the staff of Governor Hammill.

The commission, indorsed by the Governor and issued by Adj. Gen. W. H. Bailey, was granted in line with the Governor's desire to have an airplane squadron separate from the Minn.-Iowa joint squadron established in Iowa.

MISSOURI

IN addition to the regular residence courses in aircraft engineering and airport and air traffic management, and home study courses in airplane design, airplane drafting and airport and air traffic management, given by the U. S. Aircraft Engineering School, Inc., Kansas City, Mo., the following courses will be offered, according to a recent announcement of officials: airplane stress analysis, airplane mathematics and mechanics, plane salesmanship and distribution engineering, glider design and construction, and industrial engineering.

ST. LOUIS

[T. P. WAGNER]

AIR passenger service between St. Louis, Kansas City and Omaha was started December 15 by Rapid Air Transport, an Omaha concern. The schedule calls for one plane each way daily. The fare from St. Louis to Kansas City is $15, and to Omaha $27. Single-engined equipment is used.

PARKS AIR COLLEGE has announced five scholarships for students of the school. The awards are courses of from twenty to 200 hours of flying instruction.

THE price fixed by a condemnation commission for two acres of ground which the city desires to add to Lambert-St. Louis Field, the municipal airport, is $16,934. The commission awarded the owners $5,217 an acre for the ground, with an additional sum for buildings.

ILLINOIS

[E. TILTON]

CAPT. "SANDY" NUTTER of the Great Lakes Aircraft Company has presented the Dixon Aero Club with its charter from the National Aeronautical Association.

DEMENT SCHULER has been appointed a member of the committee on aviation of the Illinois Chamber of Commerce.

OKLAHOMA

TRIMOTORED airplane service between Oklahoma City and Omaha, Neb., was inaugurated by the Western Air Service Corporation, December 7.

[W. H. WITT]

PAUL R. BRANIFF, former owner-operator of the Braniff Airlines which later became the Oklahoma branch of the Universal Airlines, has returned to Oklahoma and begun operation of the Braniff Airways, Inc., operating high speed lines between Tulsa, Oklahoma City and Wichita Falls, Texas.

His new line is using specially built Lockheed Vega ships affording 40-minute service over the 100-mile trip. Four trips are made daily between Oklahoma City and Tulsa. T. E. Braniff is president; E. E.

Westerveldt, vice president and Paul Braniff, secretary of the new company.

[C. M. COLE]

TULSA entered aviation on a commercial basis early in December, with the purchase of the municipal airport. A total of $650,000 for this purpose was voted last winter, with the provision that only $400,000 would be available this year. This amount was devoted to the purchase of 385 acres of the 405-acre field, pending the sale of the 1931 issue of airport bonds. When this is effected the remaining twenty acres will be purchased, and the following year the additional $100,000 will be available for improvements.

CONTACTS

By FRANK E. SAMUELS

THE Hancock Foundation College of Aeronautics at Santa Maria has inaugurated a six-month night school training program open to the general public of the city. The decision to give these courses was brought about by the interest shown by the townspeople in the Hancock school and the attendant aviation activities at the training field.

The courses will be elementary and comparatively brief, and will be taught by the Government licensed ground school instructors regularly on duty at the college. Subjects given will include the history of aviation, air commerce regulations, theory of flight, navigation, meteorology, aircraft engines and general airplane mechanics and construction.

ESSENTIAL basic patents of the modern safety parachute, granted October 28, 1930 to Herbert L. Adams of Washington, D. C., have been assigned to the Irving Air Chute Company, Inc., according to an announcement of officials at the factory branch, Glendale. The patents involve eighty claims filed by Mr. Adams.

CONSTRUCTION of a hangar has been completed at United Airport, Burbank, by Austin and Company at a cost of $150,000. The building is of cantilever construction with four supporting columns, and has 72,000 square feet of floor space. Electrically operated doors which open in less than a minute are provided. Material used in this structure included 400 tons of steel, 11,000 sacks of cement and 3,200 tons of rock and sand.

GILPIN AIR LINE made its inaugural trip, Tuesday, December 9, between the Grand Central Air Terminal, Los Angeles, and Lindbergh Field, San Diego. The company, operating under the title of G. and G. Air Lines, is equipped with three trimotor Bach transports, powered with Hornet engines in the nose and Wright side engines.

Announce Results of Second Annual California Good Will Air Tour

RESULTS of the Second Annual California Good Will Air Tour, held October 29-November 2, were announced in December by the Los Angeles Junior Chamber of Commerce, sponsor of the tour in conjunction with the Southern California Chapter of the N. A. A., and the California Aircraft Industries Association. A total of forty-six planes and 100 persons participated in the tour which covered a distance of 1,850 miles and visited twenty-six cities.

The tour started at United Airport, Burbank, Los Angeles, Calif., and was completed at the Los Angeles Airport. Included in the twenty-six cities visited were the following: Santa Barbara, San Francisco, Sacramento, Bakersfield, and San Diego.

A statistical study of the tour revealed that approximately twenty hours were spent in the air by each of the forty-six participating planes; air line distance traveled, 1,600 miles; air line distance covered by all planes of the tour, 57,750 miles; actual distance traveled by all ships to and from the starting point and while on tour, 73,250 miles; number of persons inspecting planes, 54,250; average fuel consumption per hour, fifteen gallons; average oil consumption per hour, 1.5 gallons; total amount of gasoline consumed on tour, 10,800 gallons; total oil consumed, 1,080 gallons; average operating cost per hour for each ship, $25; and total operating cost of tour for all participating planes, $18,000.

CALIFORNIA

STUDENTS of American colleges and universities who rank in the upper one-third of their classes in scholarship are eligible to compete for the annual scholarships offered by W. E. Boeing and the Boeing School of Aeronautics, Oakland, Calif. Selection of the students who will receive the awards will be made by a nationally known committee. Each candidate is required to submit an essay not exceeding 2,000 words on one of five aeronautical subjects. The scholarships have a total cash value of $7,200. There are four awards.

THE National Airport Engineering Company, Ltd., Los Angeles, Calif., has been engaged by the City of Sacramento, Calif., to do the engineering work on the Sacramento Airport.

ALAMEDA

[H. V. WALDORF]

DURING the first four months of operation a total of 29,297 passengers were carried in planes arriving and departing from the San Francisco Bay Airdrome. Approximately eighty-one per cent of the passengers were carried in transport planes. Plane landings totaled 5,679.

THE board of directors of the San Francisco Bay Airdrome has approved construction work at the field to cost approximately $150,000. Additional hangar space and a third runway will be built.

AIR FERRIES LTD., has inaugurated a winter schedule for its San Francisco Bay Airdrome-San Francisco transbay service.

A CHAPTER of the Women's National Aeronautic Association in the San Francisco Bay region has been formed. Mrs. A. L. Gorman of San Francisco is president; Mrs. Helen Lucille Holt is vice president; Miss Goldymae Stoup, secretary; and Mrs. Grace Perego, treasurer.

OAKLAND

BOEING SCHOOL OF AERONAUTICS, Oakland, Calif., has been notified that the Department of Labor has approved it as an institution of learning for alien students. American consular offices have been authorized to consider applications for the required non-quota visas.

[H. V. WALDORF]

UNDER the direction of E. A. McMullen, the West America Air Schools has resumed operation at Oakland Municipal Airport. The company operates a fleet of five planes in air taxi, sightseeing and instructor work. Robert Jellison, former Canadian army flier, is chief pilot.

PAUL MANTZ, manager of the Palo Alto airport, has been named official air officer for Palo Alto.

(*Continued on next page*)



Group of participants in the Second Annual California Good Will Air Tour which flew 1,850 miles

(California News continued)

CONSTRUCTION of a cross runway and traffic zones, which include a boulevard stop for airplanes, is under way at Oakland Municipal Airport. The runway extending from north to south is 3,500 feet in length and 200 feet wide. It is to be surfaced with crushed rock.

SAN DIEGO

[L. M. EARL]

GEORGE DAVIS, transport student of the T. C. Ryan Flying School, is the most recent student to receive the Ryan gold precision medal as an award of merit for winning three Ryan student flight contests.

DATA reported by Frank May, traffic manager of the T. C. Ryan Flying Service, San Diego, show that in five years of operation at Ryan Airport, 54,913 passengers have been carried on local and special charter trips throughout the Southwestern section of the United States. This represents a total of 5,707 hours in the air with 529,392 plane miles and 1,325,665 passenger miles.

NORTHWEST

[F. K. HASKELL]

Third Annual Conference of Western States Aeronautic Association Held at Portland, Oregon

HAVING accomplished its purpose of adopting a definite policy in favor of coördinating Federal and state aviation activities and of making Federal and state air laws coincide, the Western States Aeronautic Association closed its third annual conference at Portland, Ore., December 6.

The Western States organization chose Denver for its next conference and elected officers. J. D. Wood of Boise was reëlected chairman of the association, and Roy T. Bishop of Alameda, Calif., legislative aviation committee, was named secretary and treasurer.

Oregon's was the only negative vote on a resolution adopted by the association that Federal licenses be required for planes and pilots flying intrastate and that Government air traffic laws be adopted by the states.

The association urged passage by Congress of enabling legislation similar to the Federal Highway Act, providing for joint action by Federal and state governments in the "establishment, construction and maintenance of a Federal-state airway system."

WASHINGTON

[C. M. LITTLEJOHN]

DAILY passenger air transport service between Tacoma and Spokane was inaugurated December 1 by Mamer Air Transport, Inc.

AIRCRAFT FLOATS, INC., has been incorporated at Seattle to manufacture aircraft pontoons and floats. The incorporators are John H. Adams, Knute S. Nelson and W. H. Sweeney.

PLANS for manufacture of Student Prince planes in Vancouver, were announced in December by Aircraft Builders, Inc.

ACQUISITION of a natural airport adjoining the town of Wilbur has been proposed by a special airport committee of the commercial club of Wilbur. Sigfried Hansen, president of the club, W. P. Connors and Henry Von Behren comprise the committee.

THE University Flying Club has been formed by a group of students of the University of Washington, Seattle. The club has an Arrow Sport purchased from the Northwest Air Service, and is using the Renton Airport at Lake Washington, near Seattle. Walter Dillingham, Boyd Bucey, Lloyd MacRae and Ralph Yeaman, organized the association. Lieut. Elden Pollock of the Northwest Air Service is the club's instructor.

UTAH

[G. PERRINS]

SALT LAKE is to have a Red Cross airfield first aid corps.

This announcement was made recently by Miss Edgarada Wedgwood, executive secretary of the Salt Lake county chapter, after plans had been completed with Gil Rich, manager of the local field. Not only will the entire field staff of some 200 men receive this instruction, but transcontinental mail fliers and other pilots, will be thoroughly trained in first aid work.

COLORADO

[I. R. ALEXANDER]

ANNOUNCEMENT of the starting of a new commercial aviation enterprise in Denver, was made recently by Eddie Brooks. The new enterprise will be known as the Brooks Air Service and will operate a seven-passenger Fokker Super-Universal monoplane for charter trips from the Denver Municipal Airport.

A WORKSHOP at the Curtiss-Wright flying field, Denver, was destroyed by fire recently when a quantity of airplane wing dope became ignited and exploded. Static electricity was assigned as the cause of the blaze.

TEXAS

[C. MORRIS]

EVERTS AERO MOTORS, INC., has been organized at Austin, Tex., for the purpose of manufacturing a new type motor to be known as Everts aero motor, invented by Walter Wade Everts of San Antonio. W. F. Smith, former superintendent of Tips Engine Works of Austin, will construct the engine and A. Vallance, associate professor of mechanical engineering of the University of Texas, will handle the technical engineering features.

THE city council of Port Arthur is taking steps for the establishment of an airport and seaplane base on and near the route of the Intercoastal Canal. The existing airport, docks, and barge slip are being surveyed, and G. N. Bliss and L. E. Thorne have been appointed by Mayor J. W. O'Neal to negotiate with the Federal Government for the acquisition of land fronting on the lake.

A $24,000 concrete apron and a $20,000 drainage system are among the improvements now underway at Love Field, Dallas. The city is making the improvements, but the county will probably bear part of the cost.

BROWNING FERRIS AERO COMPANY is the name of the new company incorporated in Dallas by Royal A. Ferris, Jr., W. A. Browning, and N. L. Leachman. The company, with a capital stock of $25,000, proposes to operate landing fields and manufacture and deal in airplanes.

PLANE service between San Antonio and Mexico City by way of Laredo was inaugurated in December by Mexican Central Airways. One-way fare over the line will slightly exceed the train fare between the cities, but the round trip fare will be considerably lower than the train round trip, according to J. S. Joffre, president.

[M. C. COOPER]

BIDS on more than a quarter of million dollars in construction at Randolph Field were opened during the month of December. In the early part of the month bids were opened for the two enlisted men's club houses, which will be one story and house the kitchen, cafeteria, lounge, and library. The two buildings will cost approximately $60,000.

Bids were opened for the construction of a sewage disposal plant and for furnishing waterworks supplies at the Field.

Robert E. McKee of El Paso was awarded contract at $41,370 for the construction of three non-commissioned officers' quarters and the Dozier Construction Company of Austin, Texas was awarded contract at $16,700 for the construction of an underground telephone conduit system at the field.

THE first cotton buying trip in the South by airplane started recently from the B. F. Goodrich factories in Akron, Ohio.

TENNESSEE

[R. ASH]

INTERSTATE AIRLINES has moved its general offices from Tennessee Sky Harbor to Cincinnati, where it will share offices of the Embry-Riddle Company.

The remaining operations personnel of the local airline company, which operates the air mail service between Chicago and Atlanta by way of Nashville, now consists of the operations manager, assistant general manager and business manager, with their assistants and several mechanics.

Traffic headquarters of the two companies are to be concentrated in Chicago. O. S. Hunt, formerly located at Sky Harbor, is to be located in Atlanta as a traffic representative.

THE 105th Observation Squadron has been moved from Nashville to Memphis, Tenn. Acquisition of the air unit for which the city has been fighting for five years, will mean the appointment of twenty-five

(Continued on page 114)

Lockheed Vega No. 1 of Standard Oil Company Has Varied Service Career

MORE than 130,000 miles in the United States, Canada and Europe have been flown by the Lockheed Vega No. 1 of the Standard Oil Company of New Jersey, according to a report of the plane's activities recently issued by officials of the Standard Oil Company. The ship is painted to represent the Stanavo trademarked Eagle and is known as the "Flying Trademark."

The plane has visited many cities in the United States and Canada. E. E. Aldrin, aviation manager of the Standard company, completed a flight in this ship from Los Angeles, Calif., to New York, N. Y., in fifteen hours and forty minutes, an unofficial record for a coast-to-coast flight made for business purposes.

In the spring of 1929 Mr. Aldrin took the plane to Europe and flew over a 6,000-mile course, visiting Belgium, Holland, Germany, Austria, Switzerland, Italy, Czechoslovakia and England.

This same plane was flown by Lieutenants W. W. White and C. McMullen on a flight from New York, N. Y., to Buenos Aires, completed in February, 1930. Last fall, the ship accompanied Major Coste and Lieutenant Bellonte on their non-stop flight from New York, N. Y., to Dallas, Texas, acting as pathfinder and escort.

Construct Windowless Factory Building

A WINDOWLESS factory building, entirely without daylight and embodying radically advanced ideas for the scientific creation of ideal light and other working conditions for employees, will be constructed by the Simonds Saw and Steel Company, Fitchburg, Mass. The plant will cost $1,500,000 to construct and will cover nearly two city blocks. The walls and roof will be punctuated by neither windows nor skylights. Systems will be installed for lighting, ventilation and noise absorption through acoustical walls and ceilings and other means. Contract for the design and construction of the plant has been awarded the Austin Company, with headquarters at Cleveland, Ohio.

GEORGE JACKSON MEAD, chairman of the executive committee of the Pratt and Whitney Aircraft Company, Hartford, Conn., has been elected vice president of the United Aircraft and Transport Corporation. Mr. Mead will have charge of the experimental and research division of the company.

A REDUCTION in the selling price of magnesium metal has been announced by the Dow Chemical Company, pioneers in the development of magnesium alloys which are one-fourth the weight of steel and one-third lighter than aluminum alloys as a class. The new price is forty-eight cents per pound in 100-pound lots or more. The cost was formerly sixty-five to eighty-five cents per pound.

THE Eagle-Ottawa Leather Company, of Grand Haven, Michigan, have moved their New York office from 74 Gold Street to 2 Park Avenue.

TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

Discussion of the Autogiro

A DISCUSSION of the Autogiro, touch-on the history of its development, its place in contemporary and future aviation, its theory, and a brief review of the work of the organization sponsoring its introduction and licensing in this country, is contained in "The Autogiro," a booklet recently published by the Pitcairn-Cierva Autogiro Company of America, Inc. The booklet is "the first complete authoritative presentation of the Autogiro, what it is, what it does, and how it does it." Photographs showing the Autogiro in operation illustrate the text.

Results of the Census in the West

RESULTS of the 1930 census in California, other Pacific Coast States and the eleven Western States are contained in a booklet recently published by the Los Angeles Chamber of Commerce.

Nicholas-Beazley NB-4 Aircraft

A BOOKLET describing and illustrating the Nicholas-Beazley NB-4-W and the NB-4-L entitled "The Future and Advantages of the New All-Metal Structured NB-4" has been prepared by the Nicholas-Beazley Airplane Company, Inc., Marshall, Mo. Detailed descriptions of the structure of these ships; a history of the NB-4's development and record performances attained by Nicholas-Beazley NB-model planes; and a general discussion of the advantages of low-wing monoplanes are included in the contents.

Flexible Shaft Handbook Prepared

RESULTS of an extensive study of the flexible shaft and its application covering a wide range of equipment in industry are contained in the "Flexible Shaft Handbook," prepared by the S. S. White Dental Manufacturing Company, Industrial Division, New York, N. Y. The book states that the flexible shaft "fills as definite a need in machine design as do gears" and that the possibilities of its use have not been fully realized even though it already has innumerable uses. The book has been prepared to enable engineers and designers to visualize opportunities for its use and to work out actual applications.

Coastal Charting Program of Hydrographic Office for Aircraft

THE Hydrographic Office is publishing monthly a pilot chart of the upper air for the North Atlantic and also one for the North Pacific as part of the organization's work of safeguarding aircraft in transoceanic or coastal flights. Sets of air charts for coasts of the United States, Mexico, Central America and the West Indies have been completed and are being issued. A series of handbooks, giving flying directions and information concerning routes and port facilities for aircraft is in the course of preparation.

Pamphlet on Micarta Airplane Pulleys

MICARTA control-wire pulleys for airplanes are discussed and described in a pamphlet identified as D.M.F. 5300-A., issued by the Westinghouse Electric and Manufacturing Company. The pamphlet contains tabulations showing the style numbers, dimensions and list prices of the pulleys in addition to photographs and drawings.

Norma-Hoffmann Ball Bearings

NORMA-HOFFMANN "Greaseal" Felt-Protected Ball Bearings are described in a pamphlet recently issued by the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

Fire and Life Safety in Aviation

NATIONAL Fire Protection Association has prepared for distribution to the aeronautical industry an advance publication of the 1930 report of the recommended good practice requirements of the Aviation Committee entitled, "Fire and Life Safety in Aviation."

Guide to Nickel Alloy Steel Products

A BOOKLET containing a tabulation of the sources of supply for the more commonly used forged, rolled, cast or drawn products made from nickel steels and alloys has been prepared by the International Nickel Company, Inc., New York, N. Y. The materials listed are the standard nickel alloy steels, the nickel chromium corrosion and heat-resistant steels, and special ferro-nickel alloys, not including cast iron.

Report on Auld Static Test

A REPORT, "The Static Test of the 38-Foot Auld 'Metalclad' Airplane Wing," has been published by the D. L. Auld Company, Columbus, Ohio. The report contains complete data on the results of a static test to determine the structural strength and rigidity of the wing, the test being supervised and conducted by Edgar R. Weaver.

Metals and Ferro Alloys

A POCKET-SIZE booklet entitled "Metals and Ferro Alloys Used in the Manufacture of Steel," has been prepared by the Electro Metallurgical Sales Corporation, New York, N. Y. The booklet, written by A. J. Priestly, discusses ferro alloy in detail.

Pamphlet on U. S. Model Aircraft

U. S. MODEL AIRCRAFT CORPORATION, Brooklyn, N. Y., has prepared a pamphlet describing and illustrating the model aircraft and accessories made by the company. The craft described are reproductions of standard planes.

Data on Elastic Stop Nuts

AGA COMPANY, Elizabeth, N. J., have prepared a booklet giving technical data and discussion of the use of elastic stop nuts in the aircraft and other industries.

Electroplating Aluminum

INFORMATION on aluminum alloys and methods of electroplating aluminum is contained in "Electroplating Aluminum," a booklet published recently by the Aluminum Company of America, Pittsburgh, Pa.

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AIR TRANSPORT EQUIPMENT INC.
GARDEN CITY, N. Y.

(Tennessee News continued,

Memphis fliers and commissioned officers and the naming of about 125 Memphis men for training as aviators.

Major Robert Haverty, war aviator and chairman of the aviation committee of the Chamber of Commerce of Memphis, is in command. Lieut. "Chick" Gardner will be chief instructor.

ALABAMA

[C. WARD]

ENACTMENT of an aviation code for Alabama, conforming largely to the air traffic rules and regulations of the Federal Government and authorizing cities and counties, either separately or jointly, to engage in airport construction and operation, will be sought at the 1931 session of the state legislature.

BIDS were to be asked about the middle of December for construction of a twenty-five plane capacity hangar at the municipal field at Birmingham, Ala., now under construction. Bids for an administration building will probably be asked for at the same time. The completed airport is to cost $1,000,000. Grading of the field is practically completed and the drainage system is finished.

LOUISIANA

[C. F. COCK]

PREPARATIONS are being made to establish a Federal radio station in Shreveport for the benefit of airlines operating in this section. The proposed station will supply weather information and broadcast other reports on a 1,000-meter frequency, according to announcement. It will probably cost $30,000. A site at Fort Humbug has been leased to the Government for twenty years by the city. The station will be equipped with two 120-foot towers and three smaller ones. Three operators and a chief operator will be required to keep the station going twenty-four hours a day. It is stated that a leased wire telegraphic service will be provided for nearby cities to gather information.

IMPROVEMENT of Bates Field, Mobile's municipal airport, to the extent of $75,000 has been authorized by the voters in a special bond issue election.

Airport bonds in this amount, along with two other public improvement bond issue measures submitted to the referendum, passed by comfortable majorities.

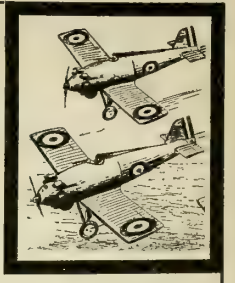
W. C. SANDERS, one of the well-known pilots of this section, has been appointed manager of operations for the Wedell-Williams Air Service, Inc., according to announcement here. Sanders takes the place of H. R. Donaldson, who will remain in charge of the Wedell-Williams field. Sanders formerly was with the Huff-Da-Land Dusters, Inc., and with Wings, Inc., participating in extensive cotton dusting operations.

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NB-3	LeBlond	Factory Rebuilt		1,950.00
NB-3	LeBlond	125	Green and Yellow	1,850.00
NB-3	LeBlond	40	Green and Yellow	1,700.00
NB-3	LeBlond	100	Black and Yellow	1,600.00
NB-3	LeBlond	125	Black and Yellow	1,450.00
Waco	OX-5	...	Blue and Silver	1,200.00
Lincoln St'd	180-E Hisso	...	Black and Orange	550.00
3-Place Lincoln St'd	Hisso E	...	....	425.00
3-Place Curtiss St'd	OXX-6	New	Silver	690.00
2 Clip Wing St'ds	OX-5	...	Silver	450.00
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FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST'S correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

GERMANY

Announce Data on Operation of *Graf Zeppelin* During 1930

THE *Graf Zeppelin* in 1930 made a total of 155 flights covering a distance of 144,275 miles and carrying 6,278 passengers and 2,200,000 pieces of mail and freight weighing 12,166 pounds, according to a report recently made public.

As an indication of the economic value of Zeppelins as traffic carriers, the sale of passenger tickets covered the cost of fuel, salaries, insurance and depreciation. The *Graf Zeppelin* will be shored up in the hangar at Friedrichshafen and the hydrogen will be removed. An inspection test will be made and on the basis of this study the normal length of life of an airship will be estimated.

Construction of a new Zeppelin, the LZ-128, has been started in the hangar at Friedrichshafen. This new airship will be inflated with helium.

AN experiment in which a specially constructed tractor was used to replace the regular ground crew in the operations coincident with the landing of the *Graf Zeppelin* and anchoring the airship to a mooring mast was recently conducted at Friedrichshafen. Successful results were obtained.

E. P. A. HEINZE

GERMAN flying clubs affiliated with the German Aviation Union (Deutscher Luftfahrt Verband) have been offered new Klemm monoplanes at a reduced cost of $820. The machines are equipped with the old twenty-horsepower two-cylinder Mercedes engine.

THE Norbayerische Verkehrsflug Company, the second largest German air transport company, will maintain six lines during the winter. Planes of this company are scheduled to connect with the trunk lines of the Luft Hansa.

THE German Albatros Company of Berlin-Johannisthal has completed a new model low-wing cargo plane, and has started test flights. This machine has been ordered by a school for the training of transport pilots. The ship is built up entirely of metal, the fuselage, tail surfaces and the wing being covered with fabric.

Inauguration of German-South American Air Mail Service Planned

IT IS planned to inaugurate air mail service between Germany and South America, Italian steamers being used in addition to German surface ships for the transport of mail between the Canary Islands and the Island of Fernando Noronha. At present air mail is transported from Germany by landplane via Barcelona to Cadiz where it is transferred to a flying boat which flies it to the Canary Islands. There it is taken on board an ocean liner and at the Island of Fernando Noronha, transferred to a flying boat of the Condor company. It was felt that the German liners sail at too long intervals for rapid transportation of the mail and negotiations are in progress for an agreement with Italy for the transport of the mail in between the German shipping schedules.

AN agreement has been reached between the Luft Hansa and the Nanking government of China relative to the joint foundation of a Chinese air transport company. It is intended to organize the Chinese airlines as a continuation of the Deruluft service between Berlin and Moscow, and the Russian Dobrolot service which connects this city with the Chinese frontier.

DR. HERMANN KÖHL has designed and constructed an experimental tailless plane. The ship is a two-place monoplane with a cantilever wing of fifty-foot span. The wing has triangular form and is built with M-sections devised by Dr. Max M. Munk, technical editor of AERO DIGEST. In the center the wing has a chord of approximately ten feet and a thickness of 1.6 feet. Two cockpits which are provided are accessible only through two manholes in the wing above them. The plane is controlled by four flaps arranged along the trailing edge, two serving as ailerons and two as elevators. The rudders and rudder fins are mounted on top of the wing tips. The plane has been tested as a glider and has proved very efficient. It will be provided with a twenty-horsepower engine and pusher screw, and, it has been calculated, will have a high speed of 118 miles per hour. This plane is the first product of a new company headed by Herr Köhl. The company plans to develop a high-speed all-wing plane for long-distance service.

AN association for airplane owners has been formed in Germany by the Luft Hansa and several other German air transport companies, aeronautical clubs, scientific institutes and training schools. This association developed from a rather loose organization of aircraft owners effected in 1929, and is known as Reichsverband der Deutschen Luftfahrzeughalter. Herr Dominicus, former Prussian minister, is president; Herr Milch, technical director of the Luft Hansa, vice president; and Herr Bruno Loerzer, general secretary.

THE Luft Hansa reports that the number of sightseeing flights doubled in 1930 as compared with 1929.

DURING the first eight months of 1930 German air mail poundage increased 38.4 per cent as compared with the same period in 1929. Aerial freight transportation increased eighteen per cent during this period as compared with the same period in 1929.

THE German air mail service to Constantinople operated with 100 per cent regularity from May 6 to August 31, 1930 in spite of adverse weather conditions.

THE Luft Hansa is augmenting its flying stock with a number of medium-sized machines. It has ordered for next season ten BFW ships, four Focke-Wulf landplanes and two Dornier flying boats.

THE German Aviation Union reports record growth in junior membership and general development of junior activities during the first ten months of 1930. The number of gliders and soarers increased during this period from 643 to 1,100, exclusive of the hundreds of machines just being completed. Three new schools have been added to the three gliding schools previously formed, and the number of practice grounds all over Germany has increased to twenty-two. There are now 163 junior groups and 130 training courses in the union. In comparison with two regional contests arranged in 1929, seven were organized in 1930. The best endurance mark attained in the 1929 competitions amounted to only three minutes—in 1930 several sail-flights of more than one hour were attained by juniors, the membership of which has increased from 4,300 to 7,000.

ENGLAND

Believe British Government May Enter 1931 Schneider Trophy Race

THAT the British government is reconsidering its decision not to participate in the 1931 Schneider Trophy Race is indicated in instructions recently given for the construction of new floats for the Supermarine S-6 and the Glostier-Napier seaplanes built for the 1929 races. The fuel tanks in these racing planes are installed in the floats. The new floats which have been ordered will be larger than the floats in the 1929 races and will have greater fuel capacities.

Entries for the 1931 Schneider Trophy Race close December 31. When it is definitely known which countries will compete, the Royal Aero Club will confer with the Air Ministry regarding arrangements for the race. Italy and France are reported to be constructing secretly high-speed planes for competition in the Schneider race.

THE Royal Air Force has completed a flight of 28,000 engine miles in West Africa, much of it over unexplored areas in tropical heat. The flight was made from Khartum and return via Bathurst, El Fasher, Fort Lamy, Kano, Sokoto, Ouagaougou, Bamako, Freetown and Kayes. Fairey-Napier 111F aircraft were used on the flight, carried out as part of the ordinary service training.

(*Continued on next page*)

(Continued from preceding page)

AN aviation employment bureau has been established by the Guild of Air Pilots and Air Navigators of the British Empire to provide a quick means of introduction between employers and airplane pilots. The bureau is for the exclusive use of members of the organization. A registration fee of approximately $5 is charged.

Hon. Mrs. Victor Bruce Completes England-Japan Solo Flight

COMPLETING a 13,000-mile solo flight, the Hon. Mrs. Victor Bruce landed at the Tachikawa airport, Tokio, Japan, November 24 in the biplane *Bluebird*. The last lap of the flight from Osaka, Japan, was accomplished in four hours. She left London, England, September 25.

Mrs. Bruce's plane was escorted to the field by a group of fourteen planes, two of which were piloted by Japanese women. She was greeted by a delegation of government officials and representatives of women's and flying organizations.

Mrs. Bruce announced that she will continue on a 'round-the-world journey, crossing the Pacific by steamship, flying across the United States from Vancouver to New York, crossing the Atlantic by surface vessel to Africa and continuing by airplane from Africa to London.

The most difficult part of the journey was the hop from Bangkok to Hanoi, flown over jungles and mountains 15,000 feet in height through adverse weather conditions. Mrs. Bruce said her greatest handicap was lack of reliable weather reports.

THE Belgian government has ordered forty-five "Firefly" single-seater biplane interceptor fighters from the Fairey Aviation Company. The ship has a high speed of 210 miles per hour at an altitude of 20,000 feet. The powerplant is the Rolls-Royce 550-horsepower water-cooled "F" type engine.

AN endurance test of 100 hours at 2,000 revolutions per minute was recently completed by a Cirrus Hermes Mark II engine, according to a recent announcement of Cirrus Aero-Engines, Ltd.

THE section of the London-Capetown line of Imperial Airways, Ltd., from Cairo to Mwanza is scheduled to be in operation January 21 when the first plane will take off from Cairo for Mwanza. The first plane from Mwanza to Cairo will start January 28.

It is planned to have the entire route from London to Capetown in operation by April. The London-Cairo section of this airline has been in operation for some time.

The fare from London to Cairo is approximately $250; and from London to Mwanza, $300.

The route will be organized in two divisions: North African, from Cairo to Kisumu; and the South African, from Kisumu to Capetown. On the inauguration of the Northern division, the route will be extended to Mwanza; and when the service is extended to Capetown, the change over will be made at Kisumu.

SPAIN

INCLUDED in the airlines suspended because of lack of subsidies are those between Sevilla and the Canary Islands, Sevilla and Larache and between Madrid, Biarritz and Paris. Available funds have been concentrated on the Madrid-Barcelona airline which carries the heaviest traffic and operates in connection with the international aerial services to Paris, Berlin and Genoa via Marseilles. The remainder of the budget was applied to the Madrid-Sevilla airline, to be operated every other day until the budget became exhausted. The Sevilla-Larache service has been taken over by the Spanish air transportation company, Classa.

Developing Airports in Spain

CITY officials of Sondica have granted a tract of land with an area of 126,557 square yards for the development of an airport. Adjacent land will be appropriated if necessary for the establishment of the field.

Appropriation of approximately $32,330 has been made to the governing board of the Madrid airport for the installation of additional facilities. The improvement of the field was to be completed at the beginning of this year when the Classa air transport company was to transfer its properties to this airport. It is expected that the general development of the field will be completed by next summer.

ITALY

Complete Rome-Capetown Flight

THREE Italian pilots recently flew from Rome, Italy, to Capetown, South Africa, along the East Coast, a distance of approximately 7,768 miles, in a total of fourteen days. The planes used were the Fiat AS-2 each powered with a single A-50 S engine.

The flight was made for the purpose of demonstrating the practicability of long-distance aerial journeys in light aircraft without special preparation.

A return flight of approximately 10,564 miles up the West Coast of Africa has been started. On the return journey the pilots will rely exclusively on local facilities because special refueling stations have not been established. Ordinary automobile gasoline obtained en route will be used.

DENMARK

Danes Sanction Mail and Passenger Airline Operated by Ford Motor Company

PROPOSAL of the Ford Motor Company to establish combined mail and passenger airlines between Copenhagen and large towns in the Norwegian provinces has been accepted by the Danish postal authorities. The service is scheduled to start in March or April and will be operated all the year around.

According to present plans, a Danish limited liability company will be formed under the supervision of the chief of the Ford company's European flying service, and the organization in the provincial towns will be in the hands of the local Ford representatives. In addition to landing at a number of towns on the route, planes will drop parachutes carrying mail and newspapers at sixteen towns. Ford trimotor transports, each capable of carrying a load of two tons, will be used. It is planned to operate the service without government subsidy.

THE NETHERLANDS

Develop Apparatus For Aid in Fog Flying at Rotterdam

AN invention to facilitate flying through fog has been tested at the Waalhaven airport at Rotterdam. The apparatus used consists of a mechanism which transmits sound from the airplane in flight to the ground, the reflection of this sound against the earth being heard in a microphone on board the plane. The height of the plane is calculated by estimating the difference in time between the transmission of the sound and its receipt in the plane's microphone. The apparatus is especially designed for flying over mountainous territory.

SWEDEN

THE government subsidy for aviation in budget for July 1, 1931 to June 30, 1932 would include approximately $171,680 for maintenance of the Swedish Air Transport Line, under the terms of recommendations which have been made. In addition, $6,700 for equipment would be provided the Swedish airline. It was recommended that $80,400 be granted to Aktiebolaget Flygmateriel, a Swedish aircraft company which was founded by the government to finance the air transport company. Of this sum, $16,080 would apply to the budget of 1931-1932. That free radio service either be provided for the air transport company or an appropriation equivalent to the cost of such service if it is maintained by the company, was recommended.

AUSTRALIA

CAPITALIZED at $1,215,000, an air transport company has been registered at Sydney and will operate a seaplane air mail service between Sydney and Brisbane, according to a recent report. The company has been granted a site at Rose Bay, Sydney, for the establishment of a terminal. Stops will be made at Taree, Kempsy, Grafton and Bellingen where mooring sites have been granted.

Plans of the company, according to reports, include the establishment of connections with the over-land services of Australian National Airways. Later it is proposed to extend the seaplane service to ports on the South Coast and Melbourne. The line will be inaugurated with twelve-passenger seaplanes carrying 600 pounds of mail and freight.

NEW ZEALAND

THE assets of the Wellington Flying Club exceed liabilities by $53,460, according to a report of activities. The club owns three planes and uses one plane owned by the government. At the beginning of the fiscal year 1931 the club had 189 members, of whom twenty-five were receiving flying instruction and five of whom had qualified for "A" licenses.

CANADA

AIR mail service throughout the winter between Moncton, N. B., and Magdalele Islands is being maintained by Canadian Airways, Ltd. These islands are cut off from the mainland by ice during the winter months.

BI-WEEKLY seven-day air mail service between Montreal, Canada, and Buenos Aires, Argentina, has been placed in operation. Mail leaves St. Hubert Airport, Montreal, on Mondays and Thursdays at 12:15 p. m. Mail from South America arrives at Montreal on Wednesdays and Saturdays at 7:50 a. m. Three days are required to transport the air mail from Montreal to Colombia; four days to Ecuador and Peru; five and six days to Chile; and seven days to Buenos Aires and Montevideo.

[J. MONTAGNES]

Air-Rail Merger Concluded

IT WAS announced recently that James Richardson, owner of the largest air transport company in Canada, has concluded a merger between the largest air transport operators in Eastern Canada, his own company and with both Canadian transcontinental railways. The new concern, known as Canada Airways, Limited, will be an air-rail system, headed by Mr. Richardson, president. E. W. Beatty, president of the Canadian Pacific Railway and Sir Henry Thornton, president of the Canadian National Railway, are vice presidents.

Canadian Airways Limited will bring many aviation interests in Canada under one head. Practically all the mail contracts are held by the companies involved in the merger.

In addition to these mail contractors, the merger includes the two largest bush operators, Western Canada Airways and Canadian Airways Limited. Flying schools and interests in aircraft manufacturing plants go with the new company.

A NEW Northern air mail service, another link in the connections established by the Canadian Post Office and the Northern settlers, is a winter air mail service inaugurated in December between Peace River and Vermilion in Northern Alberta. Peace River is the end of the railway and there is quite a settlement at Vermilion, some 200 miles to the north on the Peace River.

MEXICO

[M. HURST]

Plan Mexico-Cuba Airline

MEXICO CITY will be connected with Havana, Cuba, by airplane service in the early part of 1931. The Cia. de Transportes Aereos Mexico-Cuba, S. A. has fulfilled all of the requirements to obtain a concession and one has been granted. The trip from Mexico City to Havana will be made in nine hours. Stops en route will be made at Veracruz, Alvaro Obregon, Tabasco and Progreso. A daily service will be run to Veracruz and a three-times-a-week service from Veracruz to Havana. Twelve-passenger Stinson planes will be used to Veracruz; and from Veracruz to Havana fourteen-passenger flying boats will be used.

INAUGURATION of the Central Airport, Mexico City, will be held early in 1931. Construction of three asphalt runways and a passenger terminal is rapidly nearing completion and the engineers plan to complete these projects in three months.

THE first Americans to receive a Mexican pilot's license have been awarded their credentials by the Mexican government. They are Carl B. Schmidt and H. O. Claywell. They purchased their planes in the United States and took their flying courses in Mexico City.

A CONCESSION has been requested from the Department of Communications and Public Works by the Mexican Central Airways of San Antonio, Texas, for the establishment of a daily mail, passenger and express air transport service from San Antonio, Texas, to Mexico City, Mexico, with stops at Monterrey, San Luis Potosi, Queretaro and possibly other cities. Bellanca planes will be used if the concession is granted.

PERU

[H. GOMEZ-CORNEJO]

Paris-Lima Air Mail Service

THERE arrived at the military field of Las Palmas on November 11, a Potez 28 eight-passenger cabin biplane of the Latécore Air Mail Service, piloted by Deley and Couret, French airmen. The arrival of this ship marked the final stage in the organization by the Compagnie General Aeropostale of air mail service between Europe and Peru.

The service was actually started October 7, but on that occasion the European air mail was carried to Tacna by a Chilean plane and then transferred to a Peruvian military ship which continued to Lima. On November 11, however, for the first time since the inauguration of the service, the Compagnie General Aeropostale completed its air link between Paris and Lima using French planes exclusively. The plane left La Paz, Bolivia, at 8:20 a. m., stopped at Arica, Chile, and Camana, Peru; and arrived at Las Palmas military field at 5:35 p. m.

The Potez 28, which has a cruising speed of 125 miles per hour, made the Arica-Camana journey of 225 miles in one hour and fifty minutes. It is one of the fastest commercial planes in use in South America. The ship is powered with a 500-horsepower Hispano-Suiza engine and has a range of 1,120 miles at cruising speed.

The Peruvian government under Col. Luis M. Sanches Cerro has authorized through the Ministerial offices of the Ministry of Marine and Aviation permission to the Cie. Generale Aeropostale for their airplanes to travel throughout Peruvian territory and has given the company facilities for landing grounds and customs clearances.

DEVELOPING AVIATION IN FRANCE

WITH a steady growth in commercial aviation being reported and with a definite policy on the part of the government and private aviation companies being formulated, the budget of the Air Ministry for the present fiscal year has been increased by approximately $5,000,000 over the preceding year. This budget for the fiscal year, from April 1, 1930, to March 31, 1931, is approximately $80,500,000. Commercial airlines are being subsidized to the extent of $7,840,000, a considerable increase over the preceding subsidy. The largest single item is $19,638,000, chiefly for planes and equipment of the French air forces. Approximately one-quarter of the $2,004,000,000-budget authorized for France next year is allotted to the War, Navy and Air Ministries and other military departments for national defense.

Measures are being taken to improve aeronautical equipment and provide better administrative, organization and safety facilities in French aviation. The French aircraft industry is pursuing a policy of amalgamation and the Air Ministry has endorsed the greater centralization of control of the industry and the greater decentralization of aircraft factory sites. It is believed that this will lower manufacturing costs, improve the quality of products, increase exports and facilitate effective experimental work. Among the large groups of aircraft manufacturers formed under this policy of amalgamation is the Société Générale Aéronautique.

One of the new activities of the Air Ministry is the Aerial Safety Section. This organization was formed for the purpose of studying safety in all phases of aviation. It participates in inquiries concerning accidents; centralizes information on defects in equipment or imperfections in training systems; and oversees the enforcement of aerial safety regulations. A commission on air touring has been formed to determine the method of employing the subsidy for the purchase and upkeep of "touring" planes and to study the development of air touring. A council with two technical and two commercial committees has been organized to give authoritative opinions on air navigation and act as arbiter between the government and commercial companies.

There has been a marked increase in the export of aeronautical products by France, the chief markets being countries of Eastern Europe, with the exception of Belgium, Brazil and French Indo-China. The total value of the exports of aircraft by France in 1928 was approximately $5,597,640, as compared with a total of $8,577,000 in 1929, an increase of fifty-three per cent.

There are twenty-eight manufacturers of aircraft in France and six major companies producing aircraft power plants. In 1929, 2,400 aircraft were produced, the value of all aeronautical products produced that year being more than $30,000,000.



MODEL BUILDER'S BALANCE

MAKE IT IN YOUR OWN WORKSHOP

By

R. E. DOWD

IN any branch of aeronautics weight is of prime importance. From the most delicate flying models, which fly about indoors, to the great dirigibles, which span continents and oceans in a single flight, weight is the all important consideration. Perhaps in no other branch of designing and mechanical engineering does the question of weight occupy a position of such importance as in aviation.

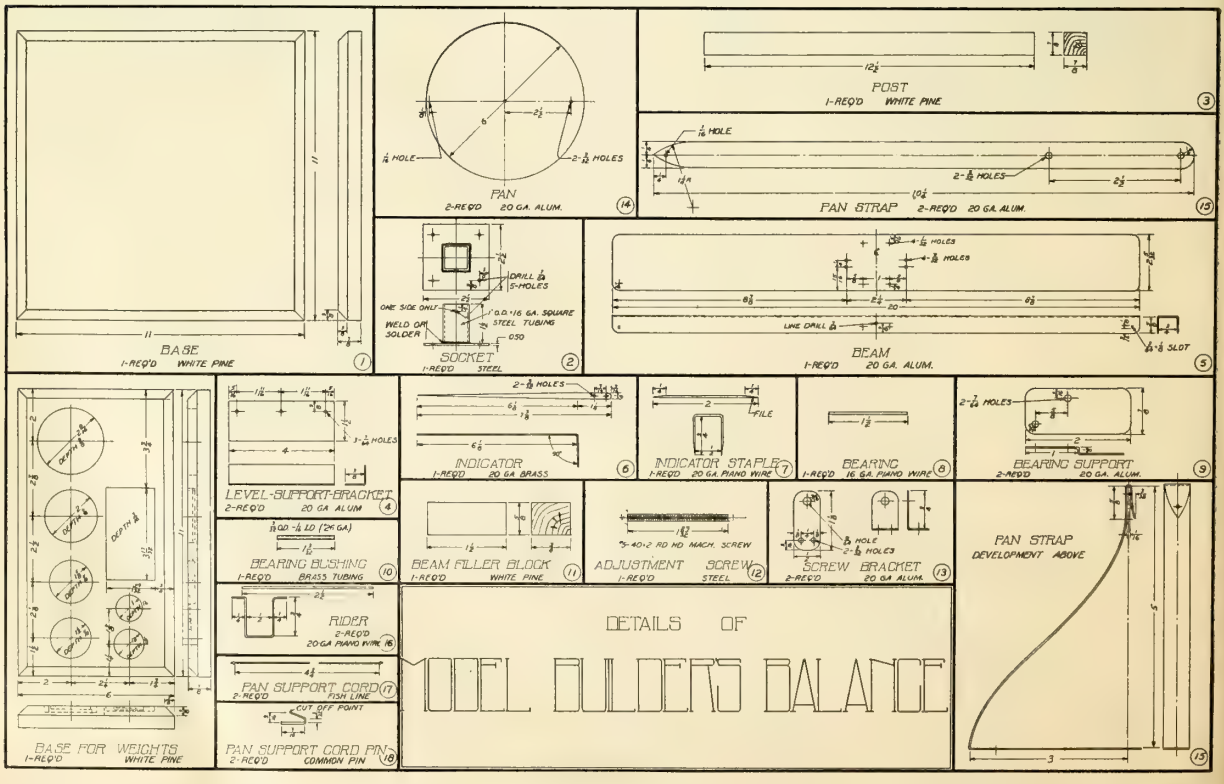
The reason for this is as simple as the importance is great. Any type of aircraft must first lift its own weight. Whatever lifting capacity remains after that has been deducted represents the useful load. This is the carrying power of the machine, and the larger it is, the more efficient the machine, such other things as speed, power required and fuel consumption being equal.

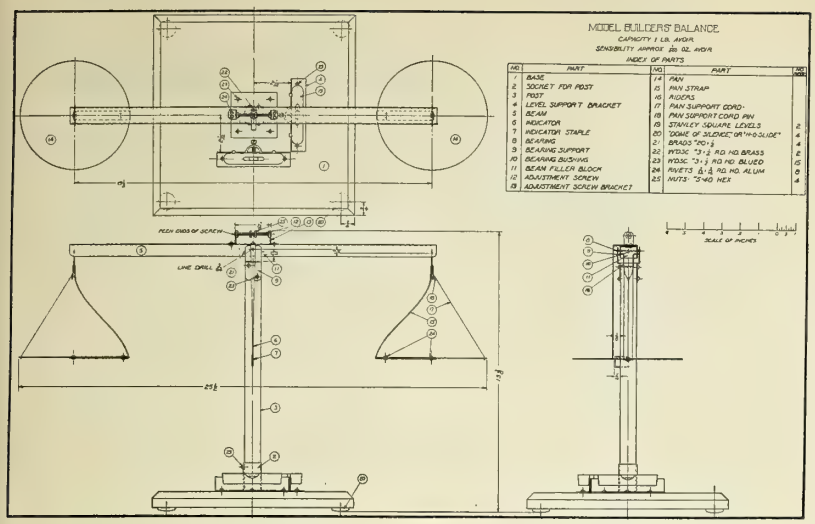
For centuries commerce has been carried on using weight as the means of determining values of various commodities. This has brought about the invention of a great many devices for weighing. The familiar grocery scale is one; another is the ice man's spring balance. One of the oldest and most reliable is the beam balance, in which the article to be weighed is balanced by known weights applied to the other end of the beam.

No laboratory would be complete without a beam balance. Some are so delicate that they are enclosed in glass cases to prevent dust and light draughts interferring with their accuracy. Of course, we do not require accuracy to such a high degree in model work, but we do want to weigh our models and parts down to *one one-hundredth* of an ounce. The balance here described will show a sensitivity of about *one two-hundredth* of an ounce. In fact, a postage stamp in one pan will tilt the beam at a considerable angle.

As we enter upon a new year of model building, there is no better time to make a resolution to study our weight problem more carefully. For this we need a balance such as described in this article.

With some model builders the quest for light construction has led to a sort of an amusing obsession. I know of a model builder who was perhaps one of the first to strive for extreme lightness in his mdoels. His model experience dates back to 1910. To quote him under ordinary circumstances, such as carving propellers or planing frame sticks of tooth pick proportions: "The way to make a light model is to plane each stick down so thin that you can see light through





it; then throw the sticks away and use the shavings!" This may be exaggerating it a little, but the general idea is right. Another familiar remark of this pioneer model builder was: "Weight! Weight! Thou elusive one!" Usually this dramatic outburst followed the placing of a new part in the pan of the balance only to find that it was exceeding the estimate by a few hundredths of an ounce!

Most model builders would like to have a delicate balance—or as we commonly say, "scale"—to weigh their parts but have found the cost prohibitive. The drawings and description this month cover a simple home-made instrument, which I designed especially for model airplane work. It is amply sensitive yet has a capacity of one pound. Such a wide range is uncommon in balances of this type. The total cost of material should not exceed seventy-five cents or one dollar, and he who is willing to work with patience can make it right in the home work shop.

Study the Drawings First

First, let us look over the assembly drawing which shows the top, side and end view of the complete balance. It will be noted that each part or sub-assembly has a reference number. Up in the right-hand corner we find a complete list of these numbers and the names of the parts. Now by referring to the parts drawing, we find all the details. For instance, the number 5 marks the beam on the assembly drawing. The same number on the detail drawing gives us all the working dimensions necessary to make the part. We even show the part before it is bent into the U cross-section. This flat form is known as the "development" of a part. In addition to this the number of each part required is given on the detail drawings.

It is a good plan to understand this system of drawings and reference numbers because it is in every day use throughout the field of mechanical engineering. All the parts of our large airplanes are worked out on the same basis. Many of us in later years will find places in engineering departments of airplane companies when our hobby develops into a regular profession. We should be able to understand working drawings in order to carry on our work. It is for this reason we are reproducing actual working and assembly drawings of the Model Builder's Balance. So let's get out the tools and make this simple balance, which will be the talk of the neighborhood when the other boys see it.

Make the Wood Parts

The wood parts consist of Base (1), Post (3), and Beam Filler Block (11). In addition to these a base for the weights can be made if we plan to purchase regular weights. If we plan to make our own weights from a standard set, the base will not be necessary. Taking up each part in order we have for the first:

(1)—*Base.* A piece of white pine board 11 by 11 by 7/8 inches thick will make the base. The edges should be beveled or chamfered as shown, 3/8" by 45 degrees.

(3)—*Post.* This too is made from 7/8 inch thick white pine. The cross-section is square and the length is 12½ inches, as indicated in the drawing.

(11)—*Beam Filler Block.* This is cut to the dimensions shown, but in assembly with the beam it may be necessary to round the corners slightly where they fit into the channel.

Now Make the Aluminum Parts

(4)—Level Support Bracket
(5)—Beam
(9)—Bearing Support
(13)—Adjustment Screw Bracket
(14)—Pan
(15)—Pan Strap

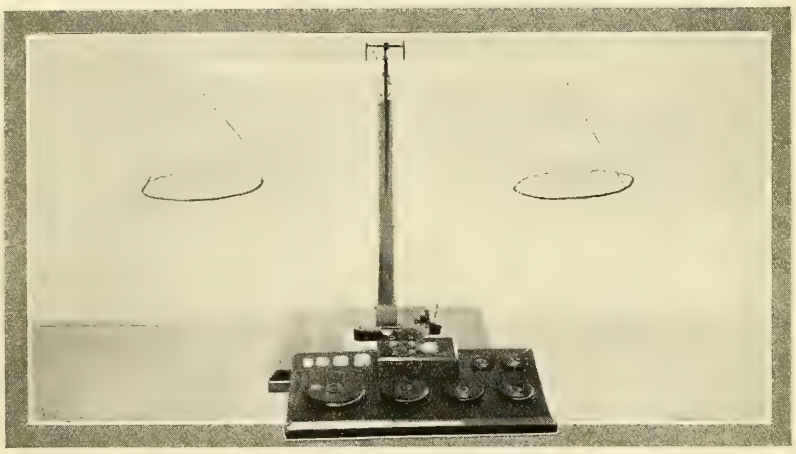
All of these parts are made from 20-gauge sheet aluminum. The complete dimensions of both developments and finished parts are shown in the drawings. Tin shears will cut the aluminum sheet easily, and a file can be used to smooth the edges. Steel wool or fine emery cloth will give the parts a nice finish after they are all formed. In forming the beam it will be necessary to make a hard wood form 5/8 by 3/4 by 20 inches. The aluminum development can be formed over the stick by using clamps and bending with a wooden mallet or a block and a hammer. The form should be straight and true, and the beam must fit it exactly. Don't be satisfied with a makeshift job. If you will have patience, the finished beam will be something of which you will be proud.

The Miscellaneous Parts

(2)—Socket
(6)—Indicator
(7)—Indicator Staple
(8)—Bearing
(10)—Bearing Bushing
(12)—Adjustment Screw (see purchased parts list)
(16)—Rider
(17)—Pan Support Cord
(18)—Pan Support Cord Pin

There should be no difficulty in making these parts, with the possible exception of the socket. If this proves troublesome, a substitute can be made by using four small angle brackets such as may be purchased at

(*Continued on following page*)



Balance made according to the accompanying drawings and description

PARIS SALON DE L'AVIATION

(*Continued from page* 99)

to be the opinion of many that its wing area was rather small for its size. This new plane, which is known as the type 280 T-1, is powered by three Hispano-Wright Whirlwind engines and has a gross weight of 11,708.5 pounds and a wing area of 690.7 square feet, which gives it a wing loading of 16.9 pounds per square foot.

The Latécoère stand included, as mentioned, a type 28 seaplane, and in addition, a new trimotor all-metal sesquiplane. This new plane, designated as the type 350, is powered by three Hispano-Suiza engines. The two lateral motors are carried at the extremities of two very short stub wings, in long streamlined nacellas, in which fuel is carried.

In addition to the *Oiseau Canari*, Bernard presented a low-wing *chasse* plane and a low-wing seaplane, which was originally built for the last Schneider Trophy races, but which was not finished in time.

Couzinet exhibited a trimotor low-wing touring cabin monoplane with a retractable landing gear.

S.P.C.A. (Société Provençale de Constructions Aéronautiques) displayed a new all-metal trimotor monoplane for commercial use.

The Farman stand included a new trimotor commercial monoplane, two single-engine high-wing monoplanes for the private owner, and a new little low-wing open-cockpit sport plane known as the type 231.

The Schreck company, which specializes in flying boats, exhibited two new *hydravions*. One of them was a biplane and the other a little two-seater monoplane built for the private owner.

Les Mureaux showed a new reconnaissance monoplane known as the 111-R.2, which is powered by a 650-horsepower Hispano-Suiza engine. Henriot exhibited several types of liaison planes for military service, as well as an ambulance plane.

Prominent among the foreign exhibitions was the big Dornier Do.S, which is powered with four 650-horsepower Hispano-Suiza engines. The passenger cabins accommodate twenty-seven. The members of the crew occupy an upper deck, the after part of which includes a chart and wireless room. Among German light planes exhibited was the little B.F.W. low-wing monoplane that won the Challenge Internationale de Tourisme of 1930, and Junkers Junior all-metal low-wing monoplane. Other exhibitors from Deutchland who showed models of aircraft included Focke-Wulf, Klemm, Rohrbach and Heinkel.

Italy was represented at the Salon by the exhibition of two Romeo Ro.5 monoplanes, two Fiat sport planes and one Breda two-seater cabin touring plane. There was also an exhibit by the Italian Air Ministry.

Great Britain was represented by the exhibition of a Bristol Bulldog single-seater fighter, an Armstrong-Whitworth Atlas army coöperation plane and a De-Havilland Puss Moth. Likewise such well-known aircraft constructors as Vickers (Aviation), Ltd., and Boulton & Paul had large stands where models of their various types of aircraft were on display. The Vickers exhibit was particularly interesting since this well-known firm builds many different types of aircraft.

A large trimotor Fokker monoplane, known as the type F.IX, which has a very spacious and well-appointed cabin, and a three-seater naval reconnaissance twin-float monoplane, comprised the display of the Netherlands.

Two Polish monoplanes were exhibited, one of which was the new all-metal P.Z.L. single-seater fighter, the high monoplane wing of which has a downward declination at the points of attachment to the fuselage so as to afford improved visibility. The second Polish plane was the Rudlicki two-seater reconnaissance plane.

The French Air Ministry had a large exhibit in which various types of military and naval machines, as well as wing sections, different types of motors and models, were shown. Although the accessory stands were too numerous to describe in detail, it should be stated that they seemed to represent every nation which boasts an air service, and included everything ranging from parachutes to a caterpillar tread landing gears. Many types of engines, both French and foreign, were exhibited. The new 1,000-horsepower Lorraine "Eider" was one of the most powerful of water-cooled motors exhibited; the Armstrong-Siddeley "Leopard" 800-horsepower geared engine was the most powerful among air-cooled powerplants. Several types of heavy oil engines were exhibited, such as the Sunbeam Coatelen and the Peugeot engine built under license from Junkers. German, English, Italian and Czechoslovakian motors were exhibited among those representing foreign constructors.

In concluding I must add a few words about the unusual attendance. I attended the Salon every day. I have, in the past, visited air shows in American cities, in London, in Paris and in Berlin, but never have I seen such an enthusiastic or numerous crowd as attended this Salon. On Sundays the Grand Palais was literally stormed by thousands of people. On the Sunday following the inauguration of the exposition particularly, the crowds were so dense inside of the building that large numbers of extra police were necessary to direct traffic around the planes and keep people moving in the aisles, while outside people stood in line four deep waiting to get in. Public interest seemed to be divided between the *Point d'Interrogation* and the huge Dornier flying boat. Indeed, it was not unusual to see crowds of people standing in line in two wide circles waiting to mount the platform and file past the cabin of the Dornier Do.S. Besides the general French public, there were a great many foreign visitors whose interest in aviation had more significance.

I wonder if this great aviation enthusiasm on the part of the French public was really air-mindedness or just curiosity. As I have learned to know the Frenchman, I have observed that he will attend air meets and exhibitions in large numbers, but he prefers to watch the other fellow do the flying.

JUNIOR ACTIVITIES

(*Continued from preceding page*)

any Ten-Cent Store. These can be screwed to the post and the base.

The Remaining Parts Are Purchased

(12)—Machine screw No. 5—40 by 2 inch Rd. head(see detail)
(19)—Stanley square level
(20)—Dome of silence or H. O. slide
(21)—Brads No. 20 by ½ inch
(22)—Wood screw No. 3 by ¼ Rd. head brass
(23)—Wood screw No. 3 by ½ Rd. head blued
(24)—Rivets 3/32 by 3/16 Rd. head aluminum
(25)—Nuts No. 5—40 Hex form

The Assembly

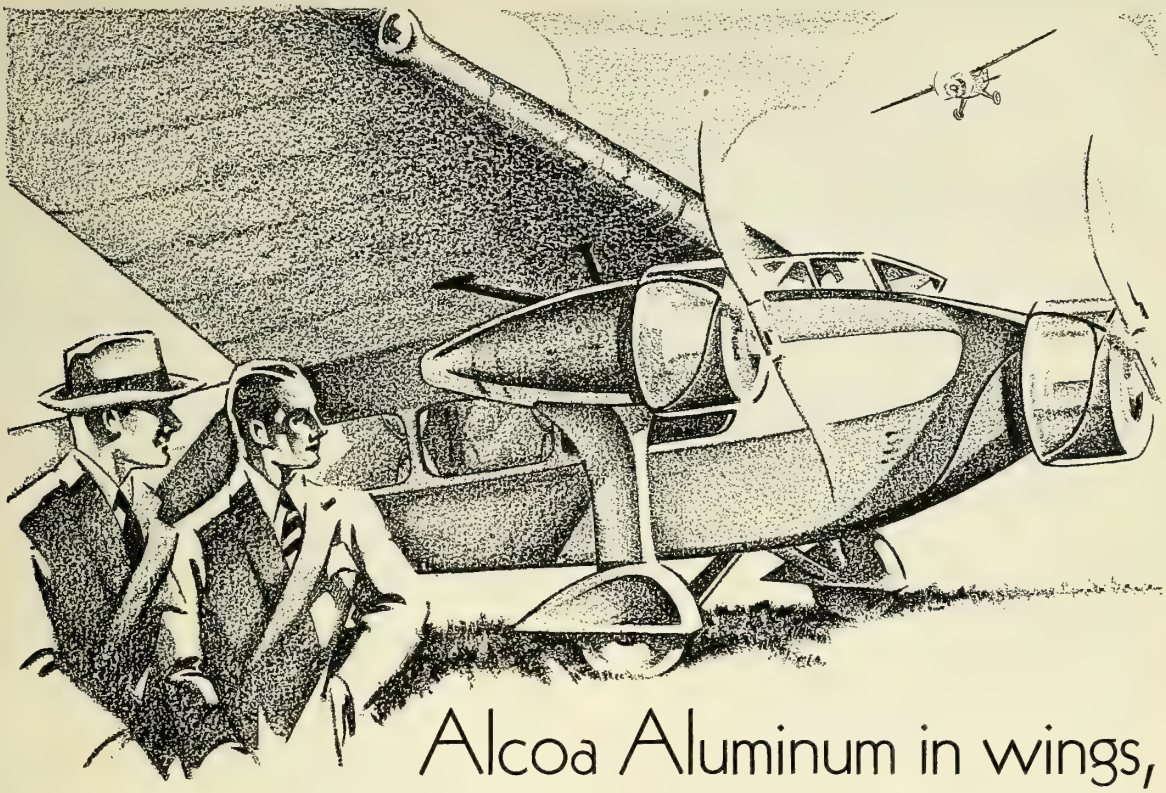
If all parts have been made carefully in accordance with the drawings, the next step is to assemble. Here again the drawing shows each point so clearly that there is nothing much to explain except perhaps that the center bearing must be absolutely free from binding. A good test is to set the finished balance on the table and gently blow on one of the pans. The disturbance in the air should cause the beam to tilt appreciably. A postage stamp in one pan should tilt the beam so that the indicator point is about an inch from the staple.

The sensitivity of a balance is determined first by the frictional resistance in the bearing and second by the location of the point at which the load is applied relative to the bearing of the beam. The reason for the beam balances is that the load of the pans is applied *below* the center bearing just as a pendulum. The nearer the three points are to lining up, the more sensitive will be the balance. In our beam the center bearing should be ⅜ up from the bottom edge of the beam while the holes in the ends of the beam for the riders should be about 3/16. By using a slot in the ends, this point can be lowered until the beam always returns to the exact center after the weights are removed. When the balance is being adjusted the base should be level in both directions. The nuts on the adjustment screw are the final means of truing up the balance for use.

The Weights

Now we are ready for the weights. If

(*Continued on page* 124)



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City..... State.....

ADAPTING THE AIRPLANE

(*Continued from page* 39)

quately to cover a big aircraft event because there was no plane to carry him. The photographer replied: "If you worked for a regular sheet, you'd have transportation like we've got."

Another illustration of the staff's attitude toward the airplane is illustrated by a brief report made to the managing editor by John M. Carlisle, a reporter who was flown 425 miles on an assignment.

Excerpts from the report are as follows:

"On the St. Louis graft story, we made St. Louis from Detroit in three hours and fifteen minutes in the *News'* plane on usual cruising speed. It was a beautiful trip. I read 100 pages of a novel en route. I came back by train because of circumstances. It took me more than thirteen hours because the train killed two motorists in Illinois. The normal train time is twelve hours."

USING THE AIRPLANE FOR BUSINESS

(*Continued from page* 51)

airplanes for business purposes has more than proved the value of this means of transportation. In addition to the three planes used in Richfield Oil Company's department of aviation for purely business purposes, we also have a large trimotored Fokker which has covered many thousands of miles. It is used exclusively for our executive personnel on business trips throughout the United States. This plane has flown a total of 1,000 hours, covering 120,000 miles without a single accident or injury.

Below is a transcript of my log for sixty days, showing the various points which I have covered in an airplane, the time it took to fly these distances, and the same time it would take to cover them in an automobile and a train. We do not feel that it is necessary to compare the costs because the time sawed will more than offset the slightly increased cost which an airplane at present has over transportation by automobile or train. The automobile time has been computed figuring a naverage speed of thirty-five miles per hour; the flying time has been figured at an average sped of 100 miles per hour; and the raliroad time is taken from the various routes.

		Distance	Flying Time	Automobile Time	Railroad Time
		Miles	Hrs. Min.	Hrs. Min.	Hrs. Min.
July					
24	Los Angeles to Stockton, Calif.....	353	3:45	10:00	11:53
25	Stockton to Montague, Calif.....	323	2:35	9:08	14:04
26	Montague to Portland, Oregon.....	362	2:40	10:12	13:56
29	Portland to Yakima, Washington...	210	1:25	6:00	25:23
30	Yakima to Spokane, Washington...	254	2:05	7:09	6:45
31	Spokane to Clarkston, Idaho.....	133	2:10	3:28	5:40
Aug.					
1	Clarkston to Baker, Oregon.....	250	1:45	6:40	15:27
2	Baker to Portland, Oregon.....	335	2:55	9:20	11.20
3	Portland to Salem, Oregon.....	204	1:15	5:29	15:50
4	Salem to Medford, Oregon.....	253	2:05	7:08	9:25
5	Medford to Corvalis, Oregon.....	318	2:10	8:38	12:25
6	Corvalis to Tacoma, Washington....	247	2:10	7:02	7:28
7	Tacoma to Seattle, Washington.....	98	1:20	2:28	3:43
8	Seattle to Portland, Oregon.....	354	2:55	10:04	18:20
9	Portland to San Francisco, Calif...	704	5:30	20:04	25:00
10	Oakland to Los Angeles, Calif.....	409	3:50	11:15	10:51
16	Los Angeles to Albuquerque, N. M..	916	6:20	26:00	23:04
17	Albuquerque to Pueblo, Colorado...	604	4:55	17:10	18:05
18	Pueblo to Wichita, Kansas.....	738	5:45	21:03	23:15
19	Wichita to Kansas City, Missouri..	242	1:50	6:32	5:45
21	Kansas City to St. Louis, Missouri.	256	2:25	7:11	7:40
22	St. Louis to Chicago, Ill.....	309	3:20	8:29	7:00
Sept.					
2	Chicago to Dayton, Ohio.....	283	3:05	7:38	8:15
4	Dayton to Columbus, Ohio.....	70	0:45	2:00	2:16
5	Columbus to Washington, D. C.....	395	3:00	11:10	14:25
12	Washington to New York, N. Y....	248	2:15	7:03	5:54
15	New York to Bristol, Pa., to New York, N. Y.	147	1:55	3.42	4:28
18	New York to Buffalo, N. Y.....	425	4:30	12:05	10:20
19	Buffalo to Detroit, Michigan.....	236	2:50	6:26	5:25
20	Detroit to Chicago, Ill.....	300	2:40	8:20	6:00
21	Chicago to Wichita, Kansas.....	807	6:35	23:02	19:15
22	Wichita to Albuquerque, N. M.....	764	7:15	21:29	22:55
23	Albuquerque to Los Angeles, Calif..	916	7:50	26:06	23:04
	GRAND TOTAL.....	12,463	107:50	349:31	414:36

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JUNIOR ACTIVITIES

(*Continued from page* 120)

the cost of a regular set is too great for your personal treasury, the next best thing to do is to borrow a set from a friend or perhaps from your druggist and make equivalents from a piece of sheet metal such as lead for the heavier weights and aluminum for the lighter units. Several systems are in general use, but the Avoirdupois, based on sixteen ounces to the pound, is the best known in English speaking countries. For convenience some interesting equivalents are listed below as nearly as we can get them without dealing with complicated fractions. One reason that the Avoirdupois is more convenient is that the fractions are the very familiar decimals which we use in measuring fractions of an inch. For example: 1/64 = .015 and 1/8 = .125. Sooner or later most of us learn these decimal equivalents and can jot them down quickly from memory in order to add totals.

By way of interest, the unit of weight known as the grain originated in England and was based on the weight of a single grain of wheat. A grain represent a weight of about 1/437 of an ounce Avoirdupois.

WEIGHT EQUIVALENTS

Avoirdupois (Fractions of an ounce)	Decimal Equivalent	Grains Approx.	Grams Approx.	Drams Approx.
1/128	.007	3+	.222	.12
1/64	.015	7	.444	.25
1/32	.031	14	.886	.50
1/16	.062	27	1.773	1.00
1/8	.125	55	3.543	2.00
1/4	.250	109	7.087	4.00
1/2	.500	218	14.175	8.00
1	1.000	437.5	28.350	16.00
16 oz. = 1lb.	16.000	7000	453.600	1056.00

In Avoirdupois weight one dram = 1/16 of an ounce or 27.34 grains (1.77 grams). One pound = 16 ounces or 7,000 grains.

In Apothecaries weight one dram = 1/8 of an ounce or 60 grains (3.888 grams). One ounce = 1/12 pound (480 grains or 31.10 grams).

In Troy weight one pound = 12 ounces and contains 5,760 grains. It is .82286 pound Avoirdupois. One ounce = 20 pennyweight or 480 grains or 31.10 grams.

Just to Check Up

Why does weight occupy such an important place in aircraft design?

Why does the beam of a balance come to rest at a certain point?

How did the grain as a weight unit originate?

How many grains in one pound Troy weight?

How many grains in one pound Avoirdupois?

How many ounces in one pound Avoirdupois? In Apothecaries weight? In Troy weight?

CURE-ALL OR MALADY?

(*Continued from page* 94)

screechy 'blowing off' of steam while a train is standing in a station. No woman likes to be startled over her meal or her book. . . .

"Our feeling was—and still is—that any woman would rather travel in an air of peace and relaxation than be hustled along with cold efficiency.

"Apparently they do! Forty per cent of our regular passengers are women."

What the railroads have learned over years of experience is surely worth considering. And what man doesn't like his comfort as well as a woman? Moreover, the railroads have found that it isn't enough to provide comfortable, advantageous travel—they tell their prospects about it.

Well, what is the answer? Is it Fare? Or is it Fear? Or isn't it entirely either, but some of both with a generous addition of "horse sense" in perfecting air travel, correcting the weaknesses by analyzing what the traveling public wants and will buy, and giving it—and then, and of equal importance, applying hard-headed business sense and hard money to selling prospective air travelers on the advantages which we have to offer them.

Here's an interesting comment from the academic world: Prof. Charles I. Gragg, of the Graduate School of Business Administration, Harvard, analyzes the aviation situation in a recent issue of the *Harvard Business Review*. He says:

"During 1929, the aviation industry presented a striking example of that stage of development, common to most industries, in which the transition from emphasis on production to emphasis on marketing becomes urgent.

"In the early months of 1930, there were many indications that the industry was beginning to recognize the need for this change in emphasis and was undertaking to formulate aggressive marketing policies."

An outside, unbiased, trained observer and analyst here puts his finger on the great weakness and the great opportunity of the industry.

Expediency, as well as common sense, points to the adoption of hard-headed business practice—to careful analysis of the present situation, to correction of weaknesses, and to an aggressive policy of selling that will win customers and income on the basis of a good service, well sold.

AIR-HOT AND OTHERWISE

(*Continued from page* 45)

interest can give this matter precedence in the Congressional mind and on the Congressional floors.

Every human being interested in the rapid recovery of the aircraft industry will understand the common sense of getting busy at this job. More than 1,000 new planes should be ordered immediately. Congress intended that they should be ordered long ago. Go after it, gentlemen, and you'll get that business! As good as any other detail of this promising situation is the excellence of the prospective customer's credit. We all love to have our Uncle Samuel heavily in debt to us. He always pays his bills. All that is needed now is team work.

And there's another place where team work might be valuable. Admiral William Pratt, the new Chief of Naval Operations, when before the House Naval Affairs Committee, came out boldly in support of the demand for more and yet more naval aviation, declaring that he would like to see every light cruiser built for the Navy fitted with flying decks and otherwise equipped for airplanes. Admiral Pratt recently succeeded Admiral Hughes. Wasn't that a lucky thing for the United States?

Beyond doubt Admiral Pratt's suggestion will be mercilessly opposed by the old-liners. Here is another job for the industry—that of seeing to it that the Admiral is rightly backed. His ideas are constructive. He must be helped to put them through. They must go before the voters. Although he cannot put them there, and although it would be improper for him to endeavor so to do, the industry properly can and should. Let's get busy at that job too.

Chairman Britten never has been characterized as an enthusiast for naval aviation. His ideas can be changed, but don't expect his association with the Naval General Board to do it. The voters in his Congressional district, in concert voicing their approval of Admiral Pratt's ideas (which of course they do approve, for they are right), would be powerfully persuasive with the Congressman. They will wish him rightly to present them during the continuing Congress, and if he does so they will wish him to serve for them another term.

It's the plain job of the industry to educate this gentleman's constituents so they will educate this gentleman. Upon the spread of popular education depends the future of our nation. What education should be more highly popular than that which will add mental value to a Congressman? Congressman Britten very well might study Admiral Pratt's views night and day for a long time.

The wisdom of selecting Admiral Moffett as a member of the Naval Conference at London, as well as his choice there as an adviser to the American delegation, is very plainly shown.

So there's another hint for team work.

Another would concern concentrated action toward developing a new five-year aircraft production program to

(*Continued on following page*)

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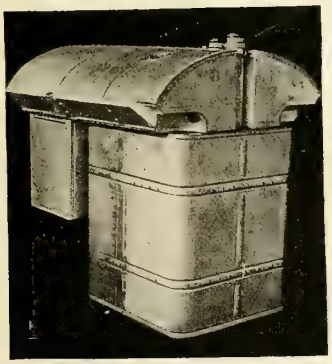
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(*Continued from preceding page*)

be put into operation the instant the present one ends. Start now on this job. It will require intense effort throughout every moment of the intervening time. The goal should be a program five times as big as that which now is ending. The country will need all of that, at least, if it is to have a guaranteed national defense. And the industry could use the orders without fear of being compelled to pay excessive Internal Revenue taxes.

GET SET FOR 1931

(*Continued from page* 46)

and sending out another batch with the pious hope that the recipients wouldn't look at the date on the postmark. And suddenly the citizens of the United States, even as you and I, decided that there wasn't much sense to this performance and resolved to cut down on the Christmas card output, so that the shortage of mail this year was enough to give Postmaster General Brown a pain in a new place.

The shake-down went far and wide, of course, and included much more than Christmas cards. Unfortunately it included also men and their families, so that the problem of unemployment hovered like a spectre above the Christmas feast. But there is a fact in this unemployment situation that is not much talked about, because it is not pleasant and because nobody knows quite what to do about it. The experts in industrial affairs know about it and will sometimes admit it. The fact is that unemployment is doing most of its damage to the inefficient, the incompetent, and the unfortunate who cannot keep the pace of the modern world. Good men in general still have their jobs. Those who don't will get them, displacing those who cannot compete with them in energy or ability. It's tough, but it's true. The shake-down is merciless and impersonal. It is like a law of nature working in the artificial structure of society—the ancient law of the survival of the fittest. And it works with business enterprises, corporations, companies and industries as it does with men.

It has worked that way with aviation and will continue to do so. There will be a weeding out of the unfit and the unnecessary, which will be bad for the particular victims but ultimately for the lasting good of aviation. We learned some time ago that while business was booming anything would sell, just as every man can get a job when the factories are howling for help. When aviation was zooming under the impetus of public enthusiasm over a new and marvelous achievement of science and human skill, it was absurdly easy to promote new airports, airlines, airplanes and accessories. It was nearly as easy to sell the securities which represented these enterprises. Now they must be good to command even the respectful attention of the wary public. And the year 1930 will go down in history as the time when the winds blew and the floods came and only the sound aeronautical enterprises came through.

Enough of them have come through and will hold their own to guarantee the future of aviation. The survivors, however, will be bound to close the ranks and present a united front to the troubles that are to come. And since we have mourned and buried the year that is past, we may now gird up our breeches and contemplate the year to come.

In my feeble opinion, it will be a year of immense increases in passenger traffic, not to be measured in thousands but in millions. The obvious basis for such an expectation is the rapid perfection of our national airway system. This network of air lanes is as essential to traffic by plane as the roads are to the automobile. The Government knew it years ago and had the courage to spend the public money for its convictions.

In 1931 we shall probably see many formidable mergers and groupings of air services, like those that have happened during the past two years. This, I maintain, is not only legitimate; it is essential to the future of commercial aviation. No system of transportation can survive under modern conditions except on a large scale. I live, for example, on a single-track railroad line, which wanders unhappily out in to the country and gets nowhere. I have ridden the owl train along the line when there were more members of the crew on board than there were passengers. I know that it doesn't pay the railroad to run a baggage car out our way with nothing in it but Mrs. Higgins' meat order, two bags of chicken feed and a crate of eggs. A half-filled freight train per day doesn't pay any dividends to the stockholders of the line nor justify the expense of pulling and handling it. It is obvious even to my ignorant observation that if this twenty-five-mile track was owned and operated as an independent enterprise there would soon be even fewer trains on it than there are now, which would mean that there would be none at all.

But because this is part of a system which covers thousands of miles, serves scores of cities and handles an enormous total of passenger and freight traffic, I can still get to town every day in all weathers and am ever encouraged to do so with special commutation rates and accommodations on the part of the conductor, who can usually find a deck of cards, a newspaper or a match on demand. The line doesn't pay but the system does, and without the little lines there would be no real system of transportation.

So don't frown, brethren, when you read of new mergers among the airlines, so long as they represent mergers of air services and not some new design upon the public pocketbook. The air transportation system has so far grown piece-meal, but it must get over it some day. And among other things, we seriously need more feeder services to the trunk airlines, both for mail and passenger traffic, and are not likely to get them until the operating companies are big enough to afford their maintenance. So bring on your mergers, provided they are financially respectable.

A second big prospect for 1931, which promises also a pretty fight, is a real reorganization and development of our national aerial defenses. The unlamented year of 1930 was conspicuous for a lot of loose talk on the topic of disarmament, most of it emanating from people who knew nothing about armies and navies and less about the modern mood of the nations of the world. A lot of letters were written to the newspapers, and Professor Einstein gave out an interview on the matter when he arrived lately in New York, which was only relatively important and sensible. Meanwhile every principal nation in continental Europe is carrying guns on each hip and a razor in its boot. Mr. Mussolini of Italy is making faces north, south, east and west, and a gentleman in Germany is shouting at all the neighbors. Russia is trying to make up its Soviet mind whether a war would not take its mind off its other troubles, and the French are wondering what to do with the biggest army in history. The naval powers are scrapping nothing but paper ships and meanwhile building airplanes like nobody's business. Even your pacific Uncle Sam came home from a disarmament conference to build a bigger fleet than ever, just to keep up with the Jones family on the other side of the ocean.

In other words, the prospects for peace are not particularly hot at the moment. We learned some years ago that a war anywhere in the world is likely to slop over on our

(*Continued on following page*)

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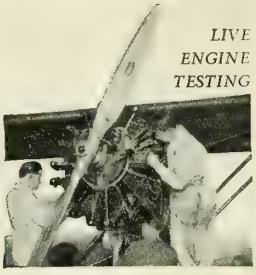
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(Continued from preceding page)

doorstep, and here and there is a military expert who knows that the weapons of the next war will strike far and fearfully by way of the air. Some time soon the United States of America must consider whether it is really ready for an international unpleasantness which may start a long way from here and still be dangerous to our peace and safety. And it should be on aviation's docket for 1931 to see that our aerial defenses are made sound and adequate.

The engineers have plenty to do in the year to come, if they are properly awake to their responsibilities. Part of the shake-down of recent years has been a new honesty in regard to aircraft, which prefers plain facts to great expectations. We can't allow imagination to have its own way any longer with the prospects of aviation. We have had about enough of fantastic forecasts like those which adorn the Sunday supplements, based on very little science or none at all and supported by the single certainty that man has learned to fly. We have heard a great deal of what the airplane is going to be able to do in the misty future—fly to the moon, land on the roof tops, carry hundreds of passengers and tons of weight, and fly blind in in any weather to anywhere.

But in the meantime the engineers have still plenty to do. There is the unsolved problem of slow flight and easy landing, which is nearly as far from an answer as it was at Kitty Hawk in 1903, so far as the conventional plane is concerned. There is the persistent fact that it takes a lot of skill and experience to operate the finest product of aeronautical science to date, which is a serious handicap to the increase of private ownership and the amateur pilot. And there is still the big gap in aeronautical design and construction which represents the so-called "flivver plane," the Model T of the air, the cheap and easy ship which might fill the skyways with real traffic and give us all a chance to see what production methods might do when applied to aircraft.

There will be real wrestling with these problems in 1931, for there is the prize of big profits waiting for the answer. There will be remarkable inventions announced and demonstrated, some of which will work and most of which will curl up and die in the Sunday papers. For there is nothing like emergency and necessity to stimulate the genius of man, and emergencies and necessities were the chief gift of 1930 to the aeronautical industry. Only the faint-hearted have quit in the face of them. The big men and the best brains are accepting the challenge of conditions as they are, and are set for 1931 as a happy new year for aviation.

And the same to you, one and all, who have said good-bye cheerfully to 1930 and contemplate 1931 with faith, hope and charity. The new year keeps its secrets, and they may be good or bad. But they are bound to be interesting and some of them will be exciting, and those who live longest will see most.

INVESTIGATION OF THE BURNELLI

(Continued from page 57)

consequently vanishes at higher angles of attack.

This angle of incidence between fuselage and wing, with a proper location of the centers of lift of fuselage and wing, makes it possible to create a stabilizing pitching moment. This characteristic has not yet been thoroughly investigated, but it is likely that because of this and the higher span of stabilizer and elevator, which the width of the fuselage structurally allows, unusual accomplishments as to

(Continued on following page)

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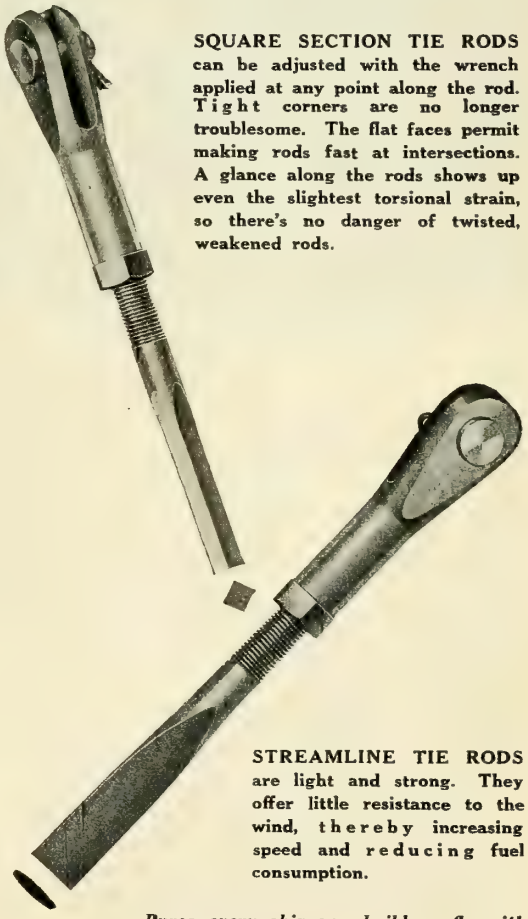
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SQUARE SECTION TIE RODS can be adjusted with the wrench applied at any point along the rod. Tight corners are no longer troublesome. The flat faces permit making rods fast at intersections. A glance along the rods shows up even the slightest torsional strain, so there's no danger of twisted, weakened rods.

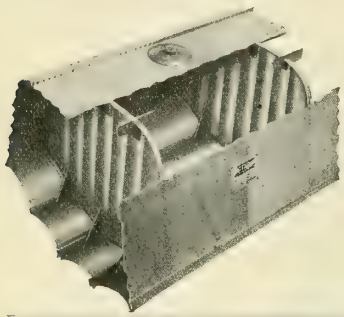
STREAMLINE TIE RODS are light and strong. They offer little resistance to the wind, thereby increasing speed and reducing fuel consumption.

Brace every ship you build or fly with

Hartshorn Est. 1860 **AIRCRAFT TIE RODS**

STEWART HARTSHORN CO.
250 Fifth Avenue New York, N. Y.

EFFICIENCY in Every Inch!





EDO FLOATS

ABOVE is illustrated one of the strict test measures which assures staunchness in every EDO all-metal Float—the factory "water test." After final assembly and riveting, with the exception of the deck sheets, each compartment is separately filled with water and minutely inspected against inter-compartment or outside leakage. The cut-away section of a float shows the sturdy simplicity of EDO design and construction. Note the rigid, corrugated bulk-heads, the die-stamped gussets, the patented fluted bottom, the freedom from complicated trussing—features which have made EDO Float strength and efficiency famous wherever seaplanes skim the water or fly the air lanes.

The choice of EDO Floats by leading aircraft manufacturers and transport companies as standard equipment is ample proof of excellence of aerodynamic design and planing qualities. Now is the time to appoint EDO as your engineering service for all float and flying boat hull problems. EDO all-metal Floats in 11 standard sizes, quickly interchangeable with wheel landing gear, are licensed for use in the United States or Canada on 37 distinct types of land planes—more than all other makes of floats combined. A letter will bring complete information and interested co-operation. Address, EDO Aircraft Corporation, 610 Second Street, College Point, Long Island, N. Y.

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All metal construction.

Anodically treated against corrosion.

Will not swell, shrink or absorb water.

Water-tight bulkheads every 2 feet.

Patented fluted bottoms for quick take-off.

Heavy keels, shallow sterns for beaching.

Flat decks for ease of taking on loads.

Wide sterns for perfect taxying.

Easy to install and overhaul.



(*Continued from preceding page*)

longitudinal control will be achieved.

Thus far the wind tunnel tests have proved that the maximum lift by no means was dangerously affected and that no undesirable qualities as to longitudinal control were to be expected. These results were thoroughly verified by extensive test flights. As to control qualities, no unusual behavior in flight was noticeable, notwithstanding the fact that the ratio stabilizer and elevator area times lever about C.G. divided by effective wing area times chord equals .273 for this plane, which is supposed to be the lowest limit for conventional planes. The test pilots pointed out that the plane has very desirable features in landing, because of the large area of the body which increases the drag at high angles beyond the stalling point, thereby reducing floating appreciably.

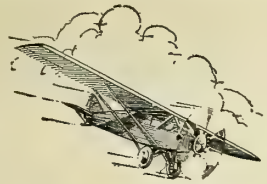
The results of the flight tests as to the lift of the body were more distinct and exceeded the wind tunnel results. The stalling speed of the UB20 checked officially three times as follows:

Gross weight in test	Measured stalling speed (*power on)	Transformed to full gross weight (17,250 pounds)
14,270 lbs.	48 m.p.h.	52.8 m.p.h.
14,270	53 m.p.h.*	56.3 m.p.h.
16,200	49 m.p.h.	50.6 m.p.h.

The first value, 52.8 miles per hour, is referred to in the following computations. The area of the wing only is 1,080 square feet, and the section that is replaced by the fuselage, is 168 square feet. If the wing area only is considered, then a lift coefficient of .0058 would be required in order to achieve this stalling speed. This is an impossible value. (The lift coefficient of the Göttingen 398 used is .0039.) If the replaced area is fully considered, a lift coefficient of .0050 results, which is still extremely high. Therefore, it must be assumed that at least 100 per cent of the replaced wing area is effectively lifting at high angles of attack and this result was further verified by the climbing performance. The adjustment of the various values derived from high speed performance, wind tunnel tests, engine output and screw efficiency, indicates that the computation of the induced resistance in climbing must be based on the full and unaffected span and that no allowance may be made for wing and fuselage interference.

The performance in climb also allows the conclusion that there is no interference of the propeller slipstream with the body. This matter, together with the most favorable cowling of the engines, the arrangement of the radiators, the flow of the slipstream through the radiator core and the effect of the suction at the outlet, is being investigated at the present time.

Another paper may deal with these features, which, though they are not primarily inherent to the wide fuselage, affect its aerodynamics and structure; i.e., the mentioned radiator arrangment, the question whether to use along airfoil fuselage or outriggers to support the tailplanes, whether cantilever or braced wing, the effect of increase in size and similar aspects. Consideration of these contingencies is necessary in order to secure to the wide fuselage plane its inherent essential advantages. The general conception that payload and performance have been sacrificed in order to gain extravagant space for the passengers is wrong and proves absolute misunderstanding of the intentions of the designer. It is this misconception which led me, by means of this article, to show by numbers and facts the advantages of this unusual design.



NATIONAL AIRCRAFT SHOW of 1931

Detroit City Airport and Hangar

APRIL 11—19

Auspices of
Aeronautical Chamber of Commerce of America, Incorporated
and
Aircraft Bureau
Detroit Board of Commerce

The 1931 National Aircraft Show at Detroit promises to be the greatest event of its kind in the history of aviation. With the entire City Airport given over to the displays—exhibits housed in the municipal hangar containing 200,000 square feet of floor space, and demonstrations given from the flying field—the 1931 National Show offers manufacturers a most unusual opportunity to place their ships and accessories before a vast and air-minded public.

At the 1930 All-American Show at Detroit 47 manufacturers exhibited 81 ships, while 124 manufacturers of accessories participated. This year with the National Show—the only important show to be held anywhere—it is apparent that the exhibits will be greater still, both in the number of manufacturers represented and the number and variety of aircraft shown. Reservations are now being made and over 70% of the available space has already been assigned.

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PRIVATEER brings to the three great air minded classes . . . flying schools, sportsmen and salesmen . . . the utility and safety of an amphibion at a price several thousand dollars under that of current amphibion costs. PRIVATEER'S price of $5,800 makes it the lowest priced amphibion in the world.

Designed by pioneer makers of amphibions . . . proved service worthy by stiff tests . . . the two place open cockpit PRIVATEER (A. T. C. 370) adapts itself to every conceivable flying and landing condition with a maneuverability that amazes experienced pilots. Combines ease of control with remarkable stability, smart appearance and the *dual safety* and *dual pleasure* of land and water. Flying range adequate for all reasonable needs . . . motor parts extremely easy of access.

A dependable Warner "Scarab" motor of 110 h. p. provides a high speed of 95 miles per hour . . . a cruising speed of 75 . . . a landing speed of 41 . . . a climb of 650 feet per minute . . . a cruising range of 250 miles. All this with a useful load of 600 lbs. . . . performance aplenty!

Naturally, because of its wide utility and low maintenance cost, dealers who sell the PRIVATEER have entry into a vast and comprehensive aviation market. Three other models in the Amphibions, Inc. fleet furnish an amphibion for any purse . . . and the Amphibions, Inc. dealer policy provides a liberal margin of profit on each sale.

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A. T. C. 370

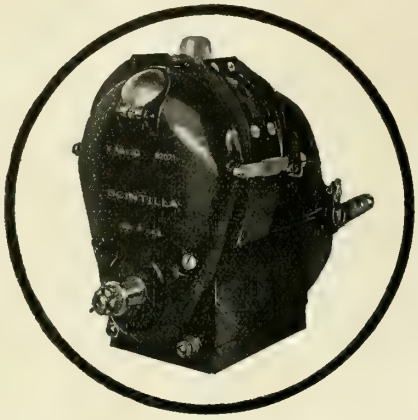
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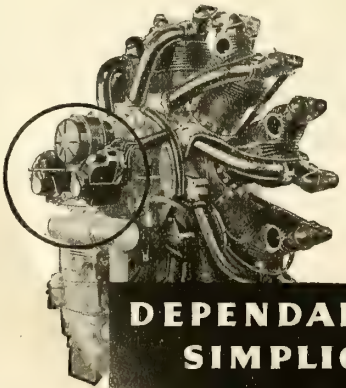
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DEPENDABILITY
SIMPLICITY
ACCESSIBILITY

HALF OF AIR ACCIDENTS AVOIDABLE?

(*Continued from page 49*)

for business and pleasure travel, the machines must be secure enough in flying characteristics, and reliable enough in powerplant performance, reasonably to insure arrival at destination, whether on or off the established airways.

Strange though it may seem, the insurance companies have made no effort toward eliminating hazards contingent upon these shortcomings of civil airplanes, and efforts by others to obtain governmental prohibition of spinning characteristics have failed to produce results.

So much for the 37 per cent of *kinds* of accidents chargeable to the machine.

The majority of accidents by *cause*—57 per cent average for the last three and half years—are debited to the shortcomings of the pilot, according to the official statistics. He is considered principally at fault if he fails to bring the plane out of a spin once it has gotten in one, or if he fails to make a good landing after the engine has expired. The powerplant, in this instance, is charged with 25 per cent of the cause of the accident and the pilot with 75 per cent of which latter 35 per cent may be charged as "error of judgment" and 40 per cent as "poor technique."

It is obvious that the reduction of spins and engine failures would also mean the elimination of the major portion of the errors now charged to the pilot. And still other piloting troubles would be avoided if the vehicle itself had a satisfactory degree of inherent security.

These charges against the pilots all promote the popular idea that operating an airplane is hazardous and requires extraordinary skill and knowledge. "Learning to fly must be made easy" says E. L. Cord, now an airplane manufacturer.

Whatever the true causes—unsafe airplanes or poor pilotage—the industry stands convicted of avoidable casualties. It must be obvious that an annual fatality for every twentieth civil airplane, represents a hazard which little aids the growth of the "air-mindedness" so extensively propagandized. Here are the figures:—

PILOT AND PASSENGER FATALITIES, 1927-1929

Sixth-Month Period Ending	Civil Airplanes In Use	Pilot and Passenger Fatalities	Ratio of Airplanes in Service to Fatality
June 30, 1927.....	1100	43	25
Dec. 31, 1927.....	3150	109	29
June 30, 1928.....	4721	162	29
Dec. 31, 1928.....	6320	222	28
June 30, 1929.....	7431	203	36
Dec. 31, 1929.....	9904	282	35
For the year 1929....	9904	485	20

Pilot fatalities are roughly half the total, taking 1929 statistics alone for study. For the calendar year pilot fatalities were 227 and passenger fatalities 258. The total was 485. A civil pilot fatality for every forty-third airplane in use at the end of the year. Curiously enough, the pilots of licensed planes suffered relatively greater casualties than did those of unlicensed craft. There is, undoubtedly, some explanation for this but bare statistics do not reveal it.

Spins or stalls accounted for 20.9 per cent, or for 355, out of the 1,698 accidents in which 1,721 airplanes were involved. Engine failure or other reasons for forced landings were assigned for 23 per cent, or 391, of the accidents. Bad landings figured 414, or more than 24 per cent,

(*Continued on following page*)

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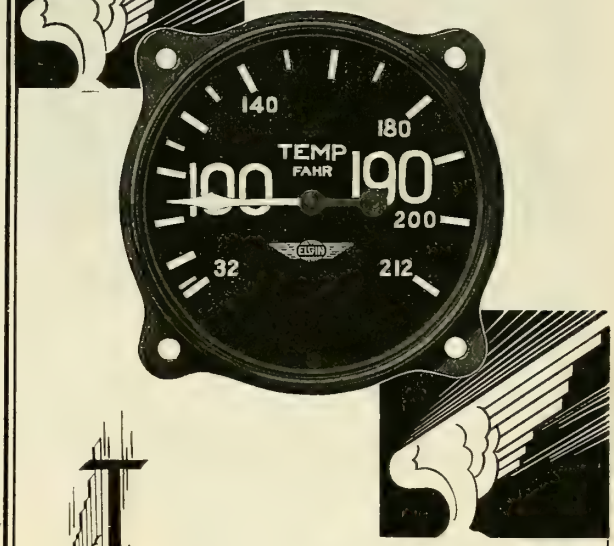
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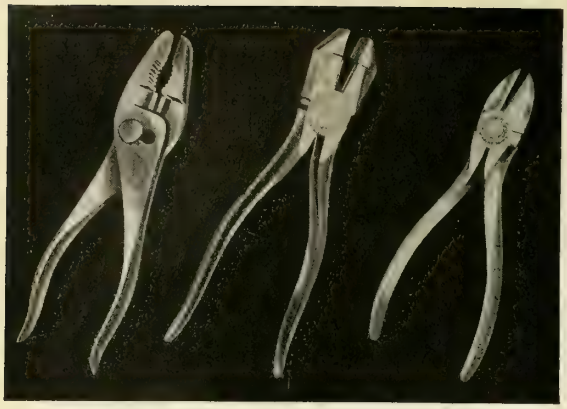
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Pliers

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OVER 650,000 IN USE

(*Continued from preceding page*)

The crash sheet for 1929 follows:

PILOT FATALITIES ONLY—1929

	Number of Planes Involved in Accidents	Pilot Fatalities	Number of Planes in Use	Ratio of Planes in Service to Fatality (per 6-month period)
		(January-June)		
Licensed planes...	633	60	4546	75
Unlicensed planes..	143	27	2885	107
	776	87	7431	85
		(July-December)		
Licensed planes...	806	106	6784	64
Unlicensed planes..	139	34	3120	92
	945	140	9904	71
Total	1721	227	9904	44

There is nothing inherently mysterious or supernatural about the flight of airplanes and there is no good reason for fostering such a notion in the public mind.

Stripped of glamor and romance, the airplane is as sound a structure as the bridge. As a vehicle, it is as commonsensical as the automobile. The airplane industry cannot forever continue to sell its products to itself, nor can it sell professional airplanes to an amateur market. There must be produced the inherently stable airplane, with other accompanying characteristics of low landing speed, still more reliable powerplants and accessories. For such, the public will provide a satisfactory market once it can realize that anyone may fly easily, safely, comfortably and freely—Federal and state regulations must be reasonable.

"GANGWAY FOR MOSES"

(*Continued from page* 48)

hope to tell you it did! Pilots with one suit—and the seat of the pants practically gone out of that—blossomed out in fair raiment and Packards. They toiled not on their motors, neither did they spin, except in the air; yet Solomon in all his glory was not arrayed like one of these. At any rate, he never had such fancy chariots as some of these former starving pilots soon fell heir to.

The day of prosperity, it seemed, had dawned. Henceforth and forever all pilots would pace the earth, when they deigned to return to it, in field boots imported from Bond Street and Piccadilly. Air mail lines would be opened up all over the country—the first transcontinental, of course, was merely a start. Moses number five was leading the way. Go it, Mose!

The only trouble was that he didn't seem to be going anywhere. He skipped out to San Francisco and back, apparently was fatigued by the journey, and sat down to rest. He rested for years, muttering an occasional prayer, "Use the Air Mail," and then going to sleep again. True, he had adopted a few pilots, bought a few airplanes. But the rest of us were as gaunt as ever. Clearly, as a Moses this old dodderer was played out. We needed a new one, with fresher glands.

Ah—who is this? Bless my soul if it isn't Moses number six in the person of one Kelley, complete with a bill to turn the air mail over to civilian contractors. Blessings on thy head, Moses Kelley; we're away in a cloud of dust and con-

(*Continued on following page*)

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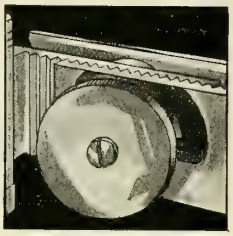


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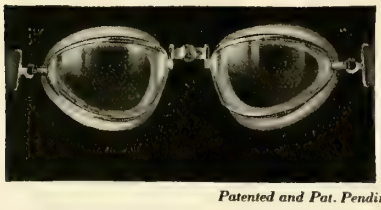
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American Optical Company
SOUTHBRIDGE, MASSACHUSETTS

(*Continued from preceding page*)

tracts *now!* Contact! Away we go, here and there. We'll give them airlines and air mail whether they ever send so much as a post card, or not.

"Or not," it appeared, was in order. If people in some of those towns along the lines of the air mail ever wrote letters, the contractors never heard of it. Certainly few of them paid the dime needed to send their communications by air. The ground, it appeared, was fast enough—or even the Erie Canal.

The air mail lines, started with great clamor, settled down to a sad perusal of balance sheets in red ink. But were we downhearted? No! *No!* NO! We knew—you couldn't fool us!—we knew that it was only a question of time before Moses number seven would heave into sight, and lead us on to the promised land. He simply *had* to appear. There was no question about it. The thing had become a habit in aviation—and you never lose a habit.

We waited, we people who really knew our aviation. We became impatient, of course. At times we would meet in the corner of a hangar and whisper petulantly, "Where is he? What is detaining him? Where is Moses?" But we never despaired. He simply had to come. It was in the cards.

Meanwhile, of course, various major prophets had appeared, had exhorted us mightily, and had disappeared into space. Billy Mitchell, the Hittite, descended among us in a chariot of fire, snorted, pawed the ground, and dug up the select Congressional Aircraft Committee, Daddy of the President's Aircraft Board. Then, after a terrific battle with a Republican court martial, the bold William snorted again most fiercely and vanished in the general direction of Virginia. It wasn't his fault that we happened to have a Republican administration when he was court martialed, nor that United States Senators have more influence than airmen with the administration. Besides, we had one Lord Bingham who had set himself up as a minor aeronautical prophet much in favor with the President who, at that time, hadn't had the pleasure of hearing the Senate's later opinions of the aristocratic Lord Hiram.

Every now and then the political shade of General William Mitchell walks even to this day, grimly clanking the anchor chains of a battleship, groans, disappears into space, and presumably rests again for a season in the Virginian tomb occupied by the F. F. V.'s. However, short though his stay was among us, painful though his end, practically complete his oblivion, yet did he lead the children of aviation into the land of the Five-Year Program. Lesser prophets have claimed that honor. Away with them, the sorry wights, with their scurvy claims! Let them peddle their puerile political prattle elsewhere! We know—we old-timers—that the five-year plan is our legacy from the departed General William Mitchell. Long may you sleep, and peaceful be your rest, oh William, among the horses! When again the Democratic donkey brays triumphant in the land, we shall call you from your retirement and make you Secretary of War.

Meanwhile we await a Moses. It is the spring of 1927. There is a stir of budding Nature. All the little green things stir in the fields. Especially at Roosevelt Field where three of them were preparing to herd Commander Byrd across an ocean. What a show that was! What promise of great things to come! There was the Commander, suave, gentle, giving erudite auditions to the grovelling gentry of the Press; there was the big Fokker, doubtless wondering when George Noville ever would get through monkeying

(*Continued on following page*)

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TRUSCON

(*Continued from preceding page*)

around with it; there was Bernt Balchen; there was Ber Acosta—or rather, there he wasn't; and there, brooding over it all like some efficient angel in spats, was Grove Whalen. What a picture, my friends. Not, I hasten t add, a moving picture. It was a still—a vast study in stil life, immobile; silent save for the constant stream of pres releases that oozed forth to gladden a world.

Day followed day, night followed night, week followe week, reporters followed Byrd. And still nothing hap pened. Not a Byrd stirred. Could this, we asked our selves, be the Moses who was to lead aviation on to vaste fields of accomplishment and high adventure? If so, when please? Meanwhile we got married, had children, raise them, educated them, kicked them out, saw them marry have children, become parents in their turn—and still the cautious Byrd remained perched on the bough. Would he never fly to Paris? We feared not.

And yet—and yet! We old-timers who knew our avia tion knew for a certainty that Moses number seven was due, over-due, past due, and gone to protest. Where was he, anyhow? Exasperated, we asked each other the ques tion. Plainly, Byrd was not the prophet. Moses was still to appear; so much was evident.

And then, unheralded, unsung, out of the West he came, the young Lochinvar, or what have you? His name, it appeared from the papers, was Lindberg, or Lindboig, or Lindenberg, or something—we couldn't remember the name until we'd noticed it several times. Sounded Jewish, but actually was Swedish. He'd made quite a flight—fastest time across the continent. The tabloids picked him up as Lucky Lindy, turned it into Plucky Lindy, gradually fash ioned a halo for him, and generally gave him to understand what he might expect if he went any further.

Meanwhile the setting Byrd took his head from under his wing, looked around once, then settled down again to hatch out some more safety factors. And the brooding spirit of Grover the Grand brooded on, in spats.

From this somnolent scene, early one morning, flew Charles Augustus Lindbergh, Paris bound. He flew away as Lucky Lindy, as Plucky, as Slim; he landed in Paris Captain Charles A. Lindbergh, landed in the United States Colonel Lindbergh, and toured the country as Augustus the First, King of the Air.

Even then we did not suspect, we old-timers, that here, in the person of this courageous, resolute, and solemnly un humorous young mail pilot we had what we had been wait ing for these many years—old Moses number seven. Ah— had you forgotten him? We almost had, ourselves. But there he was, good old Joe Miller Moses, himself, ready to do his stuff and lead us into the promised land.

And we never suspected, we aviating dumbbells who thought we knew our aviation. We knew our aviation but not, it appeared, our public. We saw a world, not the avia tion world, but the big world on the ground, go mad over this young man, who to us was merely a very good pilot— though we had not suspected him of *that* before his flight.

However, after the Paris flight all of us recognized Lindbergh as a pilot of great skill, courage, determination, and judgment. That, and no more. His spectacular flight we put down to the sound use of all these excellent quali ties, liberally seasoned with a sprinkling of essence of horse shoes and rabbits' feet. The flight may have been a scien tifically planned achievement, but just the same, the magic flavor of horseshoes was about the premises. Nevertheless, all hail to Colonel Lindbergh, said we old-timers, a spec tacular stunt pulled off well. Good boy!

(*Continued on following page*)

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(*Continued from preceding page*)

And there, so far as pilots were concerned, the matter would have rested. Lindbergh would have taken his place with the other long-distance fliers—a place well up top, but not a place unique and unapproachable.

But queer old John Public, his wife and his family, said otherwise. Here, they said, was a god, descended by some happy chance to man's low estate. Let us bow down and worship him, and the business he is in along with him. He's a wonder—and so is his business, aviation. The stuff he wrote in school-boy English was eagerly read as the Gospel according to St. Lindbergh.

In short, we saw Lindbergh as an excellent pilot, not as the Moses who was to lead us into the promised land of inflated stock promotion schemes, factories by the score to build aircraft by the hundred for a market that seemed ready and anxious to consume everything, including trash, that we could produce. And we were shortsighted in not recognizing our Moses at a glance—just as in 1929 we were blind to the fact that the fickle public was growing fed up with us and was about to administer a hearty kick.

However, in 1927, '28, and most of '29, we thought that dear old Mose had led us into that happy land for which we longed. Money was showered upon us—I speak now of a collective "us," for none was showered upon me, personally. We yelled and whooped with joy; we built factories, hired factories, hired men, built airplanes, started new lines, enlarged old ones, got this, that and the other. We leaped up and down like young gazelles, promoted ourselves and our friends to General Managers, Vice Presidents, Presidents; and paid ourselves beautiful salaries that came to us each month tied with pink ribbon.

And the amazing offices we had thrust upon us! Pilots and others who had breathed dust all their lives and spent most of their time at some flying field, moved into the city, into luxurious office buildings, and wouldn't condescend to visit more than once a month the new airports enthusiastic investors and municipalities gave us. We all became executives of the highest power. The noise of us grinding our teeth as we arrived at dynamic decisions was simply deafening. Desk tops were split by blows of the fist administered by executives of the very highest power as they laid down the law. And beautiful and talented private secretaries leaned forward intent to catch the slightest syllable of wisdom dictated by lordly Vice Presidents who a few months before had been tightening up nuts on an OX-5.

A perfectly lovely time was being had by all.

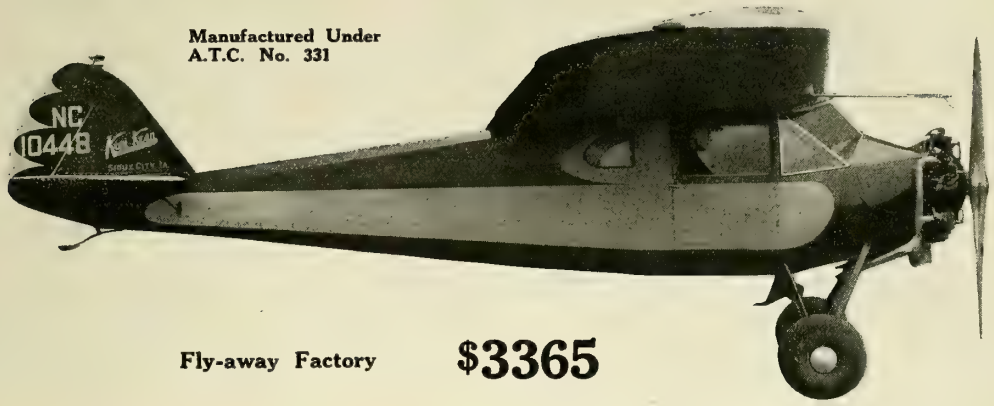
And then—and then! Ah, my six poor friends—probably like myself now in adversity—the cold, lean end of 1929 came upon us. The details are too harrowing to relate! Away went the beautiful jobs and the perfectly gorgeous salaries; away went factory after factory; away went office after office, department after department, Vice President after Vice President. Worst of all, away went the alluring secretaries, no longer intent to catch our words of wisdom, for—lo and behold!—it began to seem that not all of our words, not all of our dynamic decisions, had been wise. Many of them, it now horribly began to appear, had been too silly for words to express.

The promised land toward which Moses number seven had been leading us, now turned out to be a mirage in the desert of hard times. The limpid pools of water were brackish; the nourishing date palms were cactii; the kindly shade turned out to be the mere skeleton of an umbrella from which the cold wind of common sense had torn the gaudily painted fabric. Thus was the winter of our dis-

(*Continued on following page*)

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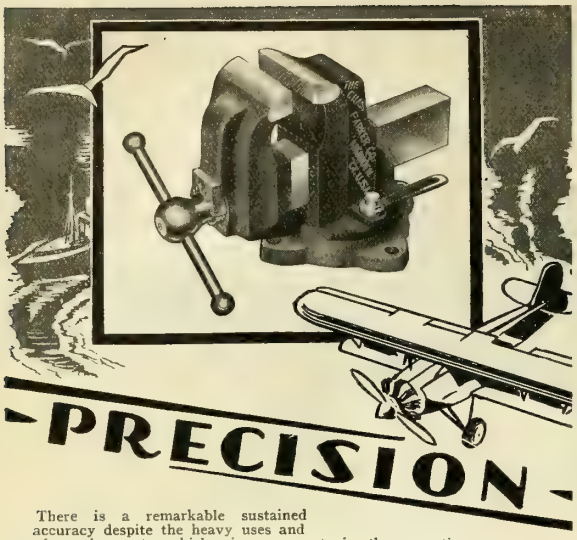


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(*Continued from preceding page*)

content thrust upon us.

And we wander still in the land of the alien, waiting and watching for Moses to come and lead us on. Some have begun to doubt that he will appear. Let them banish their doubts.

Good old Moses never fails. He has appeared to us seven times, in seven different garbs; he will appear again. Have faith, oh ye of little faith; have hope, ye hopeless; pull in thy belt, ye hungering. And hang on! Everlastingly hang on! Moses will not desert his people.

Hark! I hear a sound! Listen—do you not hear it?—the gentle splashing of the waters along the river's bank? Pharaoh's daughter is again among the bullrushes, where anything may happen. See!—She draws that tiny ark from among the flags, tows it ashore, picks up a bundle, unwraps it, recognizes it as the infant Moses. Listen!—What does she say, in fond and reverent tones? Ah!—"He needs to be changed!"

He does indeed, Pharaoh's daughter—indeed he does! The seven Moseses we had were all right; they served their turn. But we want a new one now. Land knows we *need* a new one now. Change him, Pharaoh's daughter, raise him to maturity; and let him lead us.

What is this! Why, already he is grown up. See him heading this way, toward us? See the rod in his hand? Hear the shuffling of his sandals?

Good old Moses! I knew he had to come!

And you six readers—do you see him too, as I do? Have you picked him out from the bawling crowd who want to lead the children of aviation into the promised land—the only trouble being that each prophet is pointing in a different direction, which is slightly confusing to us.

You don't see him? Why, there he is—bless his dear old whiskers!—there he is! Dear old joking Joe Miller Moses, himself, in person. I'll tell you his name—

But hold—! I've overstayed my space in this great magazine of the air, and must make way for an advertisement. Next month, if you will come with me again, I'll introduce you to Moses number eight, the authentic and eventual Moses who will lead us to the promised land—this time!

I've recognized him, I know him. He is among us today, and he shall lead us on. Good old Mose!

But before we part—I've still a paragraph—let us not be ungrateful enough to fail to recognize the great distance we have been led in the past by Moses number one, number two—right up to number seven. What though we failed to reach the promised land? The direction, you will recall, was always FORWARD. We have never turned and gone back—mark that well! Every step we have taken has been in the direction of better things; every step we shall take in the future, plodding after Moses, will be in the same direction. FORWARD! *En avant! Vorwarts!*

Meet me here next month; join me in this dish of prophetic cereal. Moses is here again and you shall meet him. Meanwhile, I leave you to enter 1931 with this prediction and advice: "CHEER UP! GOOD TIMES ARE COMING!"

THE CREATION OF LIFT BY A WING SECTION

(*Continued from page* 56)

between the location of the wing elements on the chord and their guiding power, the average angle of attack follows the angle of attack itself. If the angle of attack of the entire wing section is increased by a definite (preferably small) amount, all local angles are increased by the same

(*Continued on following page*)







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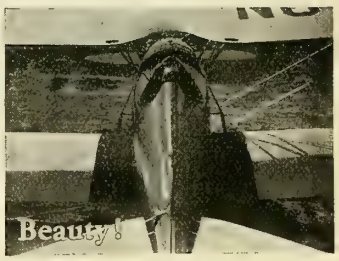
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(*Continued from preceding page*)

amount, as is also the average angle of attack. The resultant change of the guiding power of the entire wing section is therefore indepedent of the shape of the wing section; it is dependent on the change of the effective angle of attack only.

This is important. It means that the slope of all lift curves, the lift coefficient plotted against the effective angle of attack, is the same for all wing sections. It means that all equal wing areas have equal deflecting capacities.

The magnitude of this capacity is determined by the volume of air taking part in the uniform deflection of the wing section. This is the volume passing through a fictitious cross-section which, according to the arguments presented, is a definite multiple of the wing area. The computation of the constant multiplier is no easy matter; yet it is indispensable for the application of the theory. It requires higher mathematics and a lot of common and uncommon sense. The equilibrium of all mass forces and pressure forces of all pairs of adjacent air particles must be expressed in mathematical language, and the change of the wing section flow produced by a change of its angle of attack must be deduced that way. Differentials, integrals, equations, infinite series, and other paraphernalia of higher mathematics make their appearance in full glory; they give the computation an appearance of dignity and mystery. This time, however, the computation leads actually to a result. The whole mathematical battle takes place for the computation of one single constant—the ratio of the fictitious cross-section of the deflected air to the wing area. After a long fight this numerical value is obtained and the battle is finally won. The victorious army of the mathematical symbols then disperses and is sent home. The conquered province of the numerical value remains. The numerical constant over which the whole fight was waged, is nothing else but our well known π, the ratio of the perimeter to the diameter of the circle. The cross-section for the computation of the deflected air is 3.14 times the wing area. Hence the volume of the deflected air is πSV, its mass is $\varrho \pi SV$, the angle of deflection is α_{ae}, hence the change of the vertical component $\alpha_{ae} V$ and the lift results as last

$$L = \pi \, \alpha_{ae} \, SV^2 \, \varrho$$

This gives a lift coefficient

$$C_L = 2 \, \pi \, \alpha_{ae}$$

where α_{ae} denotes the absolute effective angle of attack. It is now in radians. We shall later measure the angles of attack in degrees, modifying the formula accordingly.

Both equations, which are derived from knowledge of the deflecting area and which express a universally constant slope of the lift curve, contain the absolute angle of attack and are therefore still defective. They cannot be used for the computation of the lift without additional information about the average direction of a wing section of which the absolute angle of attack is the incidence. The chord, but not the average direction, can be taken directly from the wing section as drawn. We need a rule for the determination of the average wing section direction.

The mathematical deduction of this rule is entirely outside of the scope of this series of articles, because the effort involved in that mathematical ordeal cannot give the average engineer any more penetrating insight to aerodynamic principles. This is one of those cases in which belief is better than understanding. The simplest rule existing for the determination of the average direction of a wing section refers to sections without excessive upturn of the trailing edge. With such sections the average direction is obtained

(*Continued on following page*)



35-35-2

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(*Continued from preceding page*)

by connecting the trailing edge with the center of the wing section, located halfway between leading and trailing edge and halfway between upper and lower camber. When the wing section moves parallel to this line, it does not produce any lift; the angle of attack of this line is identical with the absolute angle of attack.

As a substitute for a proof, we can at least show that this rule for the construction of the average direction is in keeping with our remarks about the larger guiding power of the rear portions of the wing section. The direction obtained does not represent the average direction of the section from a merely geometrical standpoint, but the average takes into account the different guiding power at different points. The construction favors the rear portions considerably; the direction is much more influenced by a change of the rear portions of the section than by a change of its front portions. It should be that way, and the result appears therefore entirely plausible.

We now have all relations necessary for the computation of the lift curve of the pure wing flow. Plotted against the angle of attack, the lift as computed is represented by a straight line. The curve appears straight because the angle of attack is supposed to be small. Otherwise a curved line would appear. It is, however, useless to carry the exactness further than we have done, because at larger angles of attack the guiding power of the wing is actually smaller than indicated by theory; friction prevents the potential flow from being realized. As long as theory holds at all, the observed lift curve is almost straight.

The two relations discussed hold primarily for monoplane sections. The two wings of a biplane interfere somewhat with each other, with the result that the theoretical lift is slightly diminished. Under such circumstances, the upper wing also produces more than its portion of the lift. But neither this, nor the lift of slotted wings, is markedly different from the theoretical value derived for plane sections.

Most applications of the relation $C_L = 2\pi\alpha_{ae}$ require knowledge of the lateral wing flow, which will be discussed in a later article. The relation as it stands, however, admits of one important and practical conclusion regarding efforts made in the past and those to be made in the future to increase the lift of the wings. We have to consider the principle that no air motion is, nor will be, of practical value in aeronautics unless it approaches potential flow. The efforts of the designer, by streamlining and other means, are directed toward the formation of potential flow. The designer tries to prevent the flow from deviating too much from potential flow, but he does not attempt to move the air distinctly different from potential flow, because that means a large drag.

It follows from this, as well as from the equation of this article, that any high lift coefficient of a wing will always be associated with a large absolute angle of attack. There can be no large variation of the lift coefficient without a large variation of the angle of attack. This rule became painfully evident when slotted wings were invented. Slots give a large maximum lift coefficient, but require at the same time correspondingly large angles of attack, which make their application impractical for landing and taking off without additional devices. Slotted wings are used chiefly in connection with flaps which increase the angle of attack without necessitating any increase of the angle of attack of the entire airplane.

Our arguments can be given a somewhat different turn.

(*Continued on following page*)

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(*Continued from preceding page*)

The results of our investigation can also be described by stating that the lift of the wing is of two kinds. One portion is created by a variable distribution of the local angle of attack along the chord, represented by the curvature and shape of the mean camber of the section. The remaining portion is created by a constant local angle of attack, represented by the angle of attack of the chord. The two portions are created independent of each other. This is what simplifies the theory and gives rise to the exceedingly simple relation of the article. If we do not want to give the entire airplane the whole range of angles of attack of the wing, we must either turn the entire wing relative to the fuselage, or at least a part of it; we must then vary the camber by the use of a flap or by some other means.

Thus far there has been no mention of the thickness of the wing section. The thickness by itself does not create any lift. A thick strut section moving parallel to its axis of symmetry has no lift, and if the mean camber line is curved or inclined, it is this curvature or inclination, not the thickness, that creates the lift. The thickness by itself throws the air equally up and down and fails to produce any lift by that motion.

This is the seventh of a series of articles by Dr. Max M. Munk.
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RADIO ON THE WORLD'S AIRLINES

(*Continued from page* 44)

port; Colonial Air Transport; Mid-Continent Air Express; National Air Transport; New York, Rio and Buenos Aires Lines; Northwest Airways; Pacific Air Transport; Southern Air Fast Express formerly Southern Air Transport); Stout Air Services; Transcontinental and Western Air, Inc.; Universal Air Lines; Varney Air Lines; Western Air Express; West Coast Air Transport.

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INSTRUMENTS AS A SAFETY FACTOR

(*Continued from page* 41)

navigational equipment, they would have been forced to descend on the open sea after the exhaustion of their fuel. At any rate they turned and joined the following plane which had, in the meantime, been trailing them although the pilots of this plane knew that the course was in error. The big plane's pilots had been hoping that the pilots of the smaller ship would, as they finally did, realize that something was wrong and turn toward the plane with complete equipment for guidance. This time three planes worth $20,000 each, not to speak of three pilots, were saved by the intelligent use of about $300 worth of aircraft instruments!

(*Continued on following page*)


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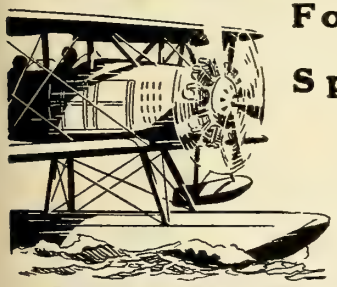
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(Continued from preceding page)

The mere presence of adequate instrument equipment is not sufficient. The instruments must be maintained in perfect operating condition. During overhauls of aircraft, the structure, controls and engine are given the most minute and painstaking examination, but the instruments are sometimes slighted. I have observed planes that were in good operating condition otherwise with instruments which, from neglect, were nearly useless. Altimeters were observed the adjusting knobs of which, designed to correct for changes in atmospheric pressure or elevation, were immovable. Air speed meters were encountered the pitot tubes of which were bent out of alignment. And compasses with the bowl only partially filled or with the glass of the bowl so covered with dirt as to render the indications more or less invisible were of far too frequent occurrence. The conditions just outlined indicated that the instruments described were rarely, if ever, used and then unintelligently. I once asked a pilot who had a turn indicator that was so badly corroded that it was inoperative why he had permitted the instrument to deteriorate and was informed that the pilot had never found any use for the gadget and was going to have it removed! This pilot cracked up about a month later while flying through moderately thick weather, and although he was fortunately uninjured, his plane was a total loss.

Even when properly maintained, instruments must be used intelligently. Very few, if any, commercial pilots are in the habit of having their compasses compensated at regular intervals. Still fewer have any conception of the calibration correction of their air speed meters. One private owner told me that he had never had much luck in hitting his destination while flying by compass. On questioning him further, I discovered that he had no idea of the magnetic variation obtaining over the terrain he had been crossing. When his compass was examined the deviation on one heading was found to be nearly thirty degrees. Another pilot, asked about his air speed meter, informed me that it always under-read so much as to be nearly useless. His habitual altitude on cross-country flights was about 5,000 feet and his cruising speed read approximately ninety miles per hour. After it was explained to him that under these conditions his true air speed was about 100 miles per hour because the altitude effect of two per cent of the reading per thousand feet of altitude, his attitude towards this instrument changed. Later he discovered that his instrument was a particularly good one and that it accomplished all that could be expected.

At the present time the requirements of the Department of Commerce with respect to aircraft instruments are far too lenient. Undoubtedly future circumstances will necessitate a change in this condition. Already in foreign countries instrument equipment, varying with the proposed nature of the employment of the plane, must be provided before the plane is licensed. Only one or two more crashes that can be attributed solely to inadequate equipment will be required before similar regulations will be issued in this country.

Criticism, without the indication of a remedy, of an undesirable condition cannot be considered constructive. Hence I feel impelled to make the following recommendations: Manufacturers would do well to equip their planes with more and better instruments—pilots to learn their use and adjustment.

In subsequent articles to appear in AERO DIGEST, *Lieutenant Ramsey will describe in detail various aircraft instruments and their use.*

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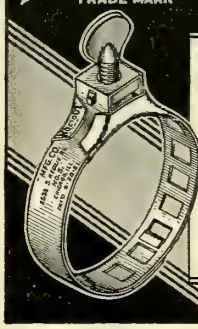
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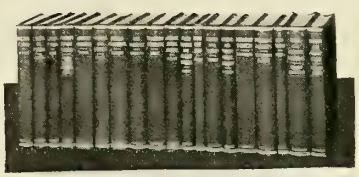
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L. C. PILOT with A and E Mechanics license. Age 20, single, free to go anywhere. Two and a half years experience on airplanes and engines. Dependable. AERO DIGEST, Box 1040.

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TRANSPORT PILOT: 10 years as instructor and cross-country pilot. Clean record, no cracks. Excellent all around licensed A and E mechanic. Experienced as Field Manager, Shop foreman or service manager. Sober and hard worker. Will accept any reasonable proposition. AERO DIGEST, Box 1044.

POSITION WANTED: Graduate Pacific Technical University, School of Drafting. 15 years experience blue print work; A1 mechanic. Willing to do shop work before entering drafting room. Prefer Eastern location. Age 40, married. Geo. W. Edens, 3443 N. Oakland Ave., Milwaukee, Wisc.

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YOUNG MAN, graduate Aviation Institute of U.S.A., excellent reference, desires to work for hours required for pilot license or salary. Will go anywhere. Write George Morgensen, 33 First Place, Brooklyn, N. Y.

POSITION WANTED in engineering department, as draftsman, stress analysis calculator, or project engineer. Graduate doctor of N.A. and M.E. Four years experience in construction and design of land planes. Supervised engineering department; have done stress analysis and aerodynamic calculation, etc. Willing to go anywhere. G. P. Casiraghi, care of The Shirley, 3305 West Avenue, Newport News, Virginia.

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Wright H3 three hundred eighty (380) horsepower at 2,000 revolutions. Weight 614 lbs. dry, mags, two Dixie 800. $1,650 including radiator and hub. Low frontal area makes it ideal for low wing racer. Communicate Capt. B. C. Moore, pilot for Thompson Aeronautical Corp., Detroit, Michigan.

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USED PLANES and MOTORS

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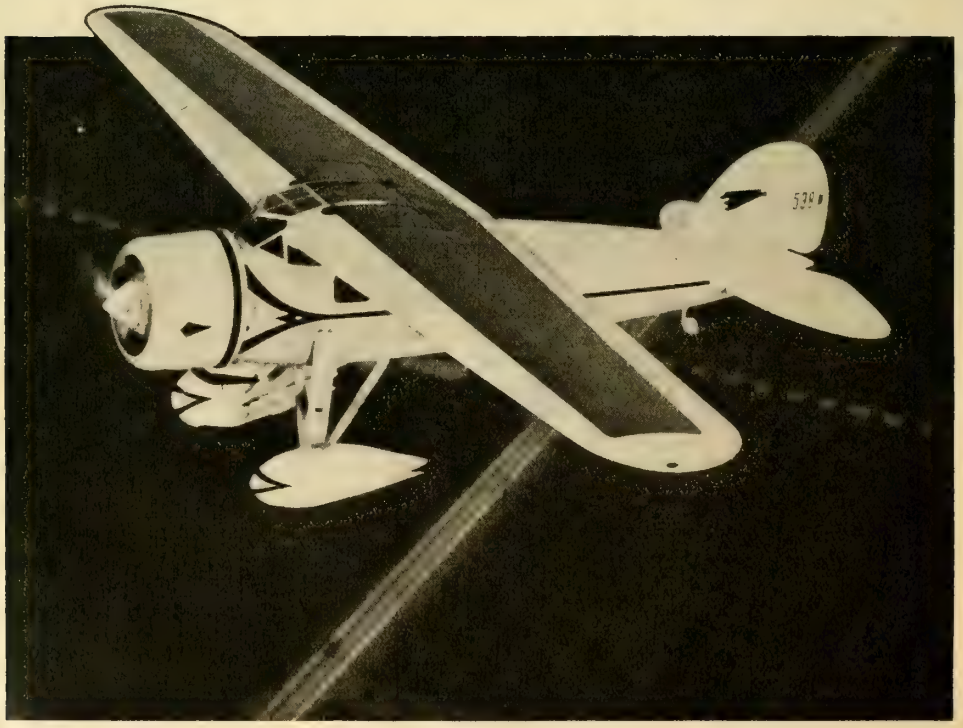
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LOCKHEED RELIES ON BERRYLOID

THE Lockheed—fast and safe—holder of one world's record after another—owes its outstanding beauty of finish to Berryloid. Streamlined to perfection—this handsome ship is modern through and through. A recent flight adds further luster to the Lockheed name—provides added evidence of the plane's amazing reliability. ¶ Flown by nationally famous pilots—five Lockheeds skimmed 1728 miles over mountains, deserts and prairies in a non-stop race from Los Angeles to Chicago. At the finish, the first two ships were slightly over 12 minutes apart—and less than 50 minutes in elapsed time separated all five! ¶ The imposing list of Berryloid users, including Detroit Aircraft Corporation, builders of the Lockheed, includes most of the great names in aviation. Berryloid Aircraft Finishes are handsome—durable—"stand up" under constant strain in the air. ¶ Put your finishing problems in our hands. For prompt service write or wire our aviation division—or the Berryloid distributor nearest you. Assure added beauty and perfect protection for your ships.



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Varnishes Enamels Lacquers
Detroit, Michigan *Walkerville, Ont.*

Over Countries, Continents and Oceans,

PAN AMERICAN AIRWAYS FLY WITH MOBILGREASE



Over the blue Caribbean, Miami-Havana-to-Cristobal and on all the 15,600 miles of Pan American's great air system, Mobilgrease is the designated rocker-arm lubricant.

Pan American Airways, like the Boeing Air Transport and the Curtiss-Wright Flying Service, have chosen Mobilgrease for its unequaled lubrication under heavy pressures and high temperatures. In operation *half* as much Mobilgrease lasts *twice* as long as any similar lubricant. Ask for Mobilgrease rocker-arm service at all established airports.

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Mobiloil Aero "W," a special "double-range" winter lubricant, has been developed for winter protection of aircraft engines. It flows readily at low temperatures, but maintains its rich lubricating quality under the heat of operating conditions. Where ground temperatures below freezing (32° F.) predominate, Aero "W" is recommended.

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Eclipse's opportunity is to continue the dependable service which Eclipse Starters and Generators have steadily performed for Aviation.

For starting 1931—for 1931 starting—let your answer be Eclipse.

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EAST ORANGE • NEW JERSEY

(Division of Bendix Aviation Corporation)

February 1931 • 35 CENTS

AERO DIGEST





Aircraft Export Trends

Airline Operations

Meteorology

Navigation

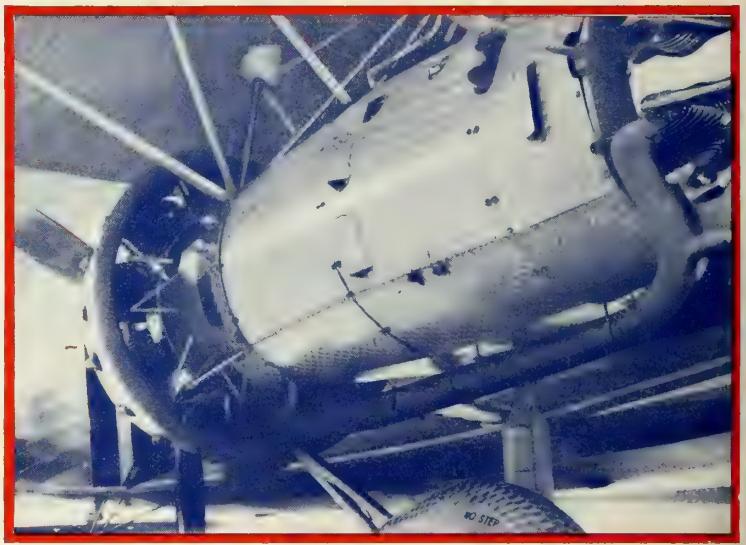
Pioneer Pilots of the West

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NEW LAURELS OF DEPENDABILITY for SERIES B "HORNET" ENGINE

In a little over a year of exacting military and commercial service the Series B "Hornet" engine has proved itself a worthy brother of the famous "Wasp." Speed, altitude and load tests have recorded its reliability. Mail and passenger carrying with the great air transport companies have shown how well this engine stands up under day and night service. And now, new laurels:

In what was probably the most strenuous 300-hour test ever made upon an air-cooled radial engine of its size, the "Hornet" B turned in new proof of its inherent stamina. Seventy-five hours of this test were made on full throttle. The remaining 225 were run at 90% power rating—far above normal cruising speed. Immediately after the test, the engine was placed on an electric *calibrated dynamometer*, where it pulled 635 H. P. at its rated speed of 1950 R. P. M., and at 2100 R. P. M. it registered 660 H. P. Power output increased steadily throughout the test, and final teardown and inspection revealed only moderate and normal wear of moving parts.



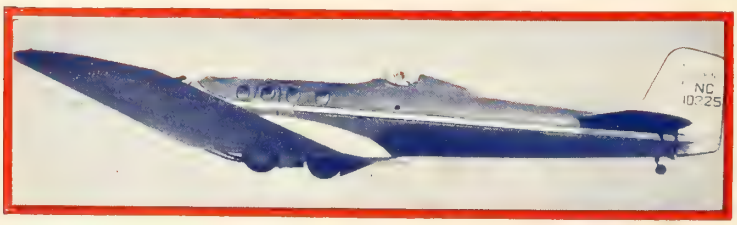
The illustration shows the new cowling developed for pusher "Hornet" B engines. It gives material improvement in speed and performance on the Fokker F-32 transport plane on which it has been installed



The Consolidated Fleetsters used by NYRBA lines, now part of Pan American Airways, are powered with Series B "Hornet" engines of 575 H. P.

No wonder Series B "Hornets" used by Western Air Express have an average of 450 hours.

No wonder 36 of these engines in the service of Pan American average 424 hours per engine—and many have logged 600 hours of service under tropic weather conditions. On over 90% of the important, regularly scheduled air transport lines of this continent, engine reliability is being made a certainty by the use of "Wasp" and "Hornet" engines.



A Pratt & Whitney Series B "Hornet" engine furnishes 575 H. P. for the new Boeing Monomail—fast, luxurious passenger and mail plane of the Boeing System

Wasp* & Hornet* *Engines* *

*REGISTERED TRADE-MARK

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PRATT & WHITNEY AIRCRAFT CO.
EAST HARTFORD . . . CONNECTICUT
Division of United Aircraft & Transport Corporation

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, Quebec; in Continental Europe by Bavarian Motor Works, Munich; in Japan by Nakajima Aircraft Works, Tokyo.

AERO DIGEST, February, 1931. Volume 18. Number 2.
Published monthly by Aeronautical Digest Publishing Corp., at 220 W. 42nd St., New York, N. Y. Yearly Subscription $3
Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 187

PROTECTION

To travel in the early days of American civilization was putting it mildly—dangerous. Today one may travel by air, land or sea in comfort and ease. • It is



significant that no matter which method of travel you choose, you will find that numerous parts of that airplane or boat, train or automobile are protected against the perils of rust and corrosion by the Udylite process. • And the protection afforded by Udylite is not for a day or a week — it is for a continuous indefinite period.

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The AUTOGIRO

. . . its potentialities to the Airplane Industry

The inherent aerodynamic stability of the Autogiro, by permitting take-offs, landings and all normal flying maneuvers with *slow deliberation,* cuts the pilot training period at least in half and makes it entirely possible for the average individual to consider the operation and ownership of an aircraft, as he now owns and operates an automobile. The Autogiro eliminates the need for the lightning-like decisions that now put such a premium on highly expert flying skill. Dependence upon such skill is one of the great limiting barriers to growth of the airplane industry.





Above: After a short run of 30 to 40 yards, reaching a speed of about 25 miles per hour, an Autogiro can immediately assume an extraordinarily sharp angle of climb. In addition to the great practical value of its ability to utilize almost any open, level spot of ground, the inexperienced pilot or passenger is freed of his dislike and fear of the long, high-speed ground run, necessary for the average airplane.

At left: This photograph shows the Autogiro in slow flight. Note the shadow thrown by the craft. What would be a disturbing position for a plane of the conventional type, is freed from all danger by the ability of the Autogiro to fly with slow deliberation at speeds as low as 20 miles per hour or at speeds well over 100 miles per hour.

The Autogiro affords unusual maneuverability. It can turn in a remarkably short space and at low speeds, although capable of speeds well over 100 miles per hour. To the novice, this ability to turn without fear of loss of speed adds tremendous security. Furthermore, if he desires he can check his speed and let his Autogiro settle safely on any clear spot of ground.



Below: Demonstrating the ability of the Autogiro in emergencies to check its speed and gently descend in front of any obstacle it cannot clear. An impossible performance for the conventional airplane. In normal landing, the Autogiro can check its own speed, deliberately choose its landing spot, hover for a moment and set itself on the ground with a jarless ease — with no forward speed at all. Probably the most amazing demonstration of the value of the Autogiro principle, and a tremendous relief to teacher and student of flying alike.







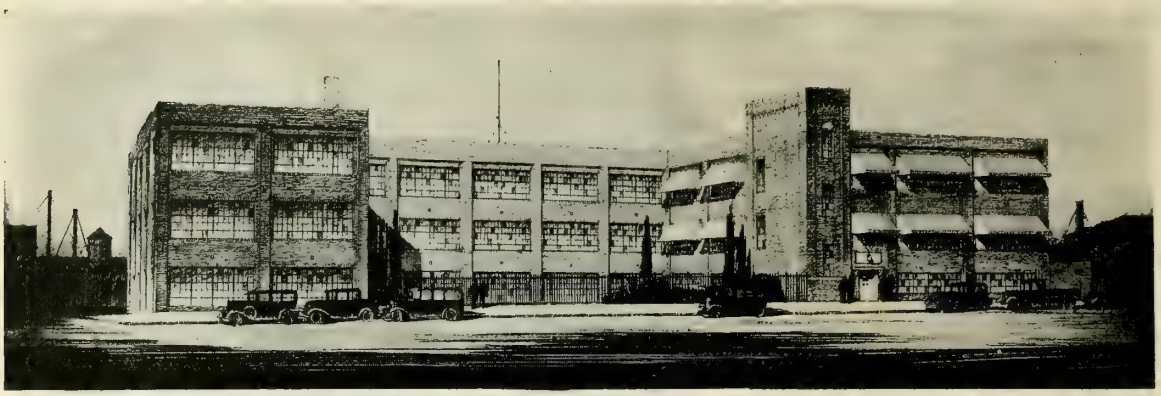
Above: The camera here caught the Autogiro just after it settled over the surrounding trees and a moment before its wheels touched. Autogiro performance frees the novice from the hazards of high-speed take-off and high-speed landing. Outstanding pilots agree that it will cut the time and cost of learning to fly more than half.

The Autogiro Company of America is not a manufacturing or selling company; it is solely an engineering and licensing organization. It controls, exclusively, all Autogiro patent rights in the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full co-operation of our engineering staff.

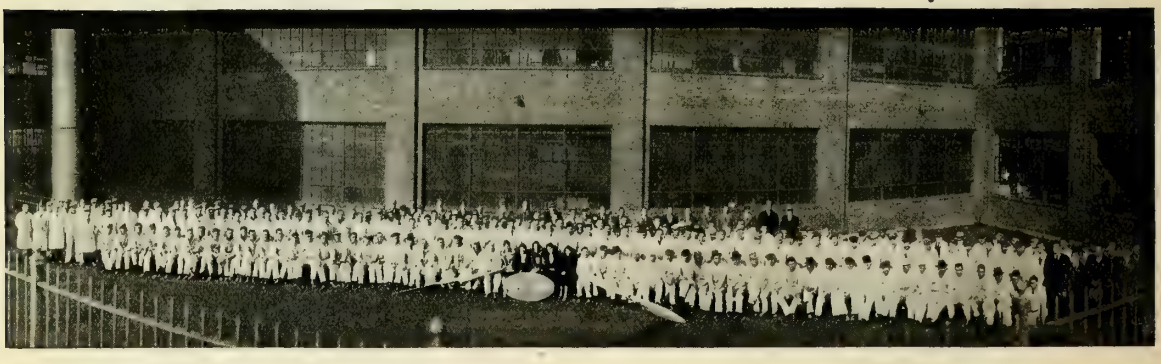
AUTOGIRO

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AUTOGIRO COMPANY OF AMERICA, LAND TITLE BUILDING, PHILADELPHIA



PERSONNEL AND PLANT THAT CONTRIBUTE TO *PROVEN DEPENDABILITY*



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The men who work on Hamilton Standard propellers must necessarily be something more than just good mechanics. Both blades and hubs involve painstaking hand shaping as well as accurately controlled machining. These men take as much pride in the contribution which the *dependability* of Hamilton Standard propellers has made to greater safety in air operations, as they do in the contribution which their *efficiency* has made in the more spectacular records for speed and altitude.

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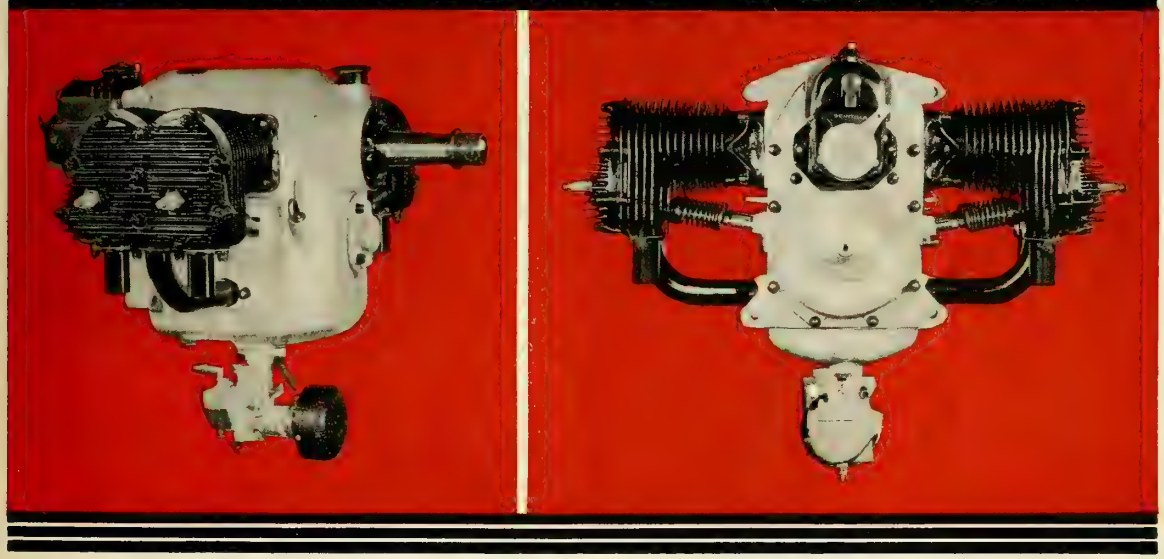
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OFFERS THE A-40 for LIGHT PLANES

FOR IMMEDIATE DELIVERY



Power—35 h. p. at 2500 r. p. m.

Weight—138 lbs. dry with magneto and carburetor.

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General Office and Factory, Detroit, Michigan

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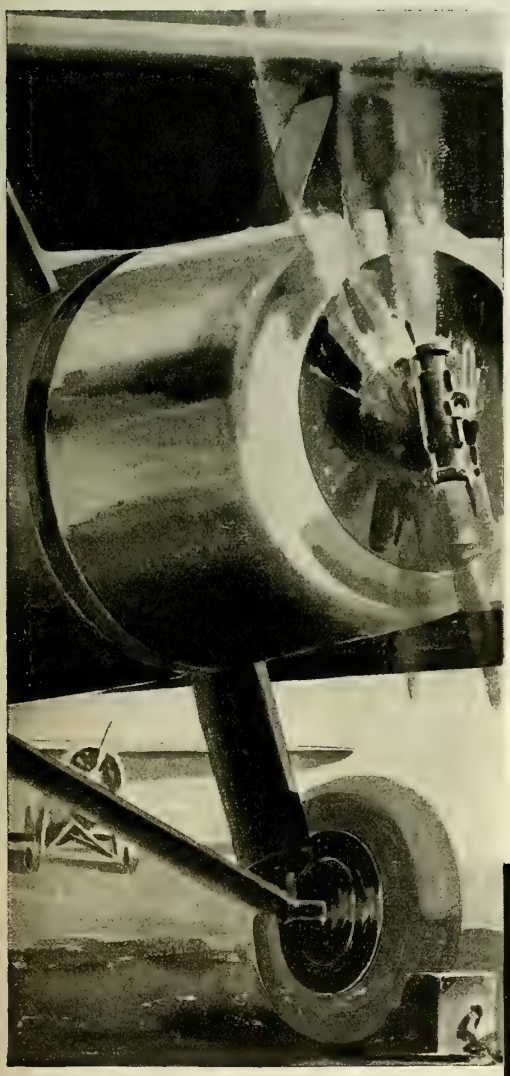
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CARL M. SNYDER, Managing Director

Smooth IDLING»

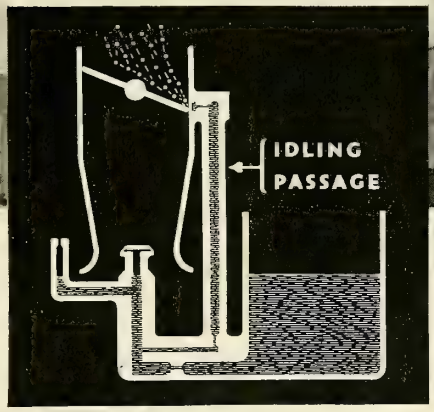


SMOOTH low speed operation is now possible in air-craft engines. One reason is that Stromberg Carburetors fuel the engines uniformly at low speed, keep them running smoothly, evenly, yet able to pick up at the slightest touch of the throttle.

To assure low speed fuel delivery, Stromberg Carburetors have a thin tube, or idling passage, from the fuel chamber to the top of the carburetor just above the throttle. With throttle completely closed, and the engine turning over slowly, there is sufficient suction to raise the fuel through the idling tube into the engine. At low speeds, the idling system operates entirely independent of the main fuel metering passages of the carburetor. As the throttle is opened, and the suction in the carburetor increases, fuel begins to flow through the main system, and delivery from the idling system decreases.

Stromberg engineers, with 22 years of carburetion experience, will gladly cooperate in working out any carburetion problem.





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BENDIX STROMBERG CARBURETOR COMPANY

« DIVISION OF BENDIX AVIATION CORPORATION »

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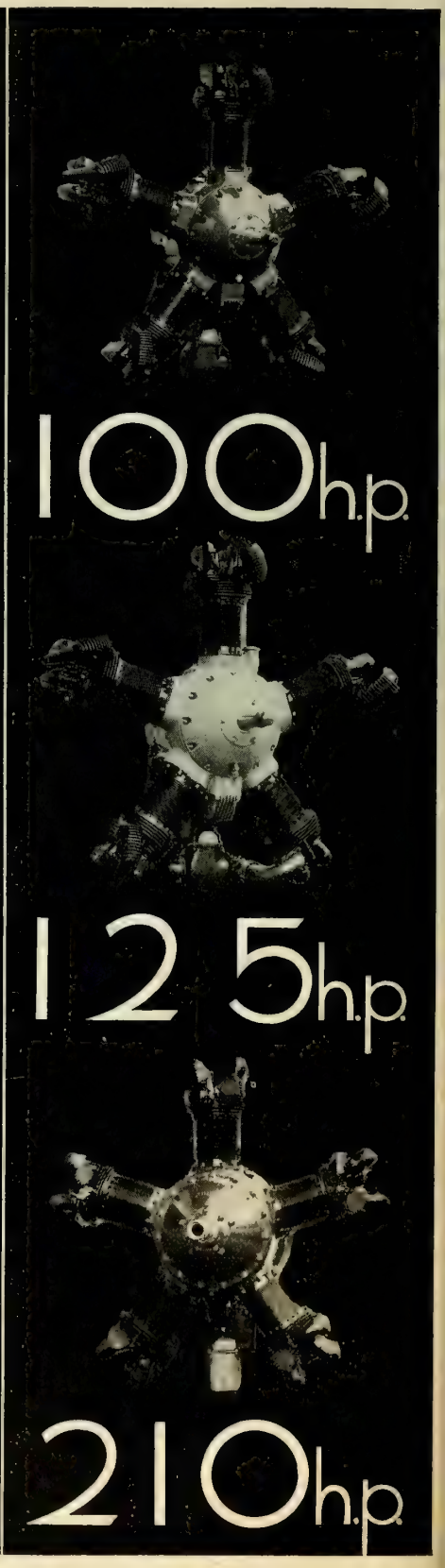
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Also

-TP- Aero Rocker Arm Lubricant

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2777

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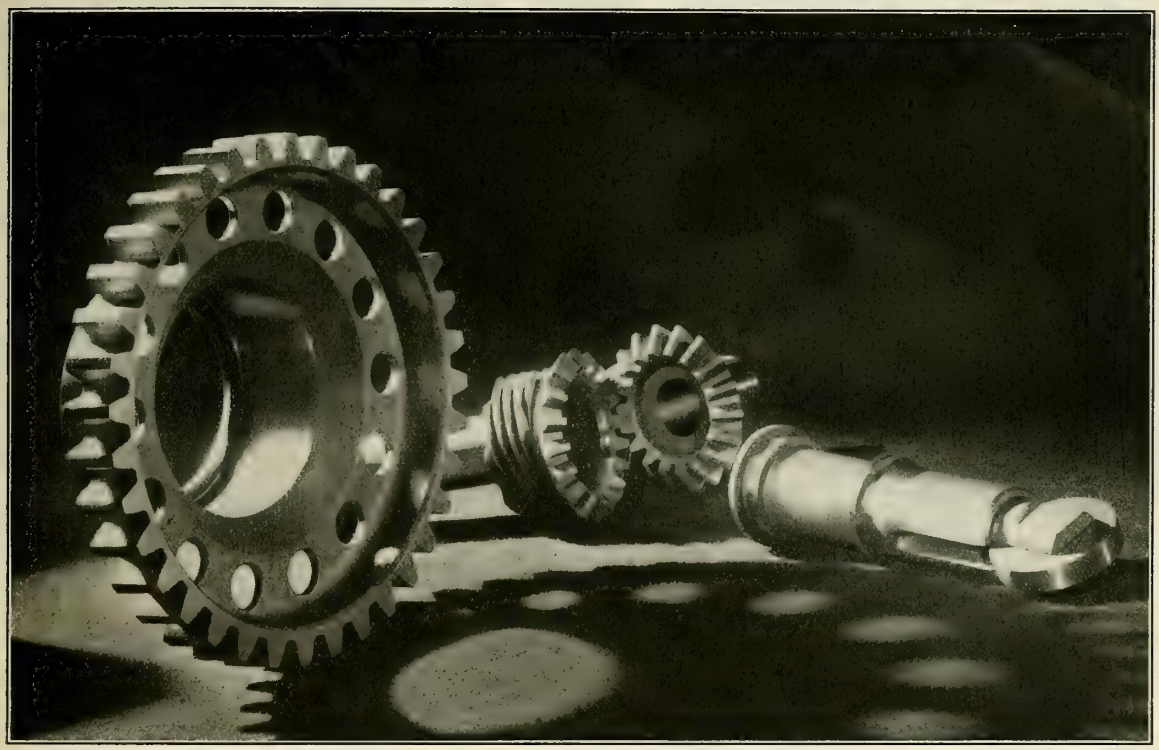
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FAIRFAX AIRPORT KANSAS CITY, KANS.

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AC MIKO SPARK PLUGS

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When the "Columbia" was fitted out for its third trans-Atlantic flight, the AC Miko spark plugs used were *taken right out of stock.* Twice before, this history-making ship had successfully flown the Atlantic with *regular-production* AC spark plugs. Lindbergh used *regular-production* ACs when he flew to Paris. A score of other famous flights have been made with them.

AC engineers see to it that every AC spark plug is as reliable and efficient as modern science can make it. AC's careful control over raw materials, AC's precise manufacturing methods, AC's searching inspection and tests—*guarantee* constant quality.

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A BIG .... PICKED FROM THE

In which Monocoupe paired with Kendall and famous pilots rode to victory!



Jack Hinchey, sportsman pilot, chose Monocoupe and Kendall Oil to bring victory at the races.



Phoebe Omlie took three first places in four races.



Pilot John H. Livingston. One first, two second and one third prizes are to his credit.

IN the series of derbies and speed events of the 1930 National Air Races, the world of aviation witnessed a circumstance of commercial ships becoming fighting ships—fighting against time with throttle-limit speed—sturdy wings taking the full banking strain of steep turns around pylons—motors driving hour after hour in derbies that had at Chicago a distant goal that lay beyond mountain and valley—pilots concentrating always in obtaining the last ounce of power from their ships. From that greatest of air races comes an example of how famous pilots and a single make of plane and its manufacturers unanimously selected Kendall Oil as lubrication and scored a remarkable list of victories!

R. A. Cole, of Mono Aircraft Corporation, sums up the performance facts: "Monocoupes were entered in three derbies and took first prizes in all of them—took eleven first prizes and sixty percent of the prize money in fifteen closed-course races in which they were entered. Mono-Aircraft Pilot Vernon L. Roberts won five first prizes in five races—a perfect average."

BUY AT THIS SIGN PENZBEST KENDALL MOTOR OILS IT IS YOUR PROTECTION

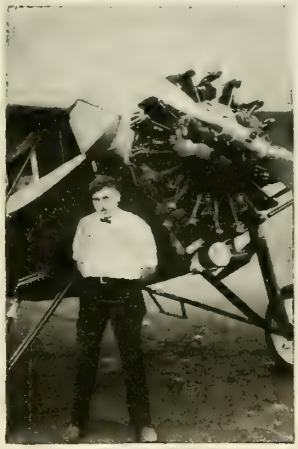
KENDALL

Use the

RECORD
NATIONAL AIR RACES



ladys O'Donnell, winner of one cond and one third prize as pilot of Monocoupe.



R. T. "Stub" Quimby won the prize money with one second, three third and two fourth places.



Vern Roberts made a perfect average at the races, with five first places in five events entered.

The complete list shows that Monocoupes, Kendall lubricated, won 11 first rizes, 10 second prizes, 9 third prizes, 5 fourth places and 3 fifth places. On his page are pictured a number of the well-known pilots who put their rust in Kendall Oil and again proved it aviation's most dependable oil.

One of the greatest assurances that every pilot of every plane may have f the unfailing reliability and efficiency of Kendall Oil is the willing and incere praise of other pilots who put Kendall to repeated, difficult tests. Your notor, like others, will give its best under the abiding goodness of Kendall. Call for Kendall next time the oil needs changing.

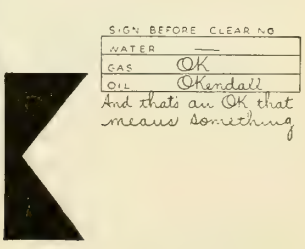
Kendall is refined from that premium Bradford Grade of Pennsylvania crude il—the world's finest. Kendall refining methods assure absolute uniformity, urity and quality for every lubricating condition. For full information of hese outstanding qualities and a complete list of airports where Kendall Oil is sold, address, Kendall Refining Company, Bradford, Pennsylvania.



Barton Stevenson won one first, two second and two third prizes against lively competition.

OIL REFINED FROM 100% BRADFORD GRADE OF PENNSYLVANIA CRUDE

Air Mail!



IN *SPITE* OF "HARD TIMES"

HERE'S an advertiser who took more business out of the aviation industry during the past six months than he did during any similar period since 1922.

AIR TRANSPORT EQUIPMENT, Inc.

ROOSEVELT FIELD, GARDEN CITY, N. Y.

January 14, 1931

AERO DIGEST
New York, N. Y.
Gentlemen:

Never, since we started to advertise in AERO DIGEST back in 1922, have we been so grateful for the excellent results we have obtained from advertising in your magazine as in the last six months, during which time the industry has been at its wits' end to know where to get business.

More inquiries, more orders, but less curiosity seekers. This has been our experience in advertising in AERO DIGEST and we are looking forward to 1931 with confidence, knowing that we can reach the aircraft trade quickly and economically through advertising in AERO DIGEST.

Very truly yours,

(Signed) A. A. Pedu

WHICH proves that AERO DIGEST produces business even during dull periods. Particularly when "times are hard" does the DIGEST's broad circulation emphasize its decided leadership and influence in the aeronautical field. Whether business is good, bad or indifferent, you can always develop new sales leads through AERO DIGEST by virtue of the fact that it will carry your message to the largest number of available prospects. Ferreting out and developing the largest possible number of new prospects, as well as retaining the old, is advertising's big job in 1931.

at the RYAN FLYING SCHOOL
SAN DIEGO CALIFORNIA

U.S. DEPT. TRANSPORT Approved COMMERCE FLYING SCHOOL



"We Leave for San Francisco at 7 o'clock"

Above: T. Claude Ryan and Chief Pilot Jerry Jones give final cross-country instructions to a group of RYAN Students before taking off in a fleet of Great Lakes Sport Trainers.

It's a typical "winter" week-end at RYAN School. . . Student pilots have been selected. . . Schedules and courses are mapped out. . . Final arrangements have been made for the RYAN Student cross-country flight from San Diego to San Francisco and return.

Climb into the cockpit of one of these trim Great Lakes Sport Trainers and join them as their course leads northward to Los Angeles; over the majestic Tehachapi Mountains along the famous night air mail Ridge Route; over the oil districts of Southern California; across the Mojave Desert; skirting above the orange groves and the Blue Pacific until the late afternoon sun in a cloudless sky finds this school formation of uniform aircraft approaching the Golden Gate of San Francisco. Frequent stops are made at prominent airports enroute and definite lessons have been learned. It's all a part of RYAN training.

Next week-end will bring another cross-country event—with a compass direction of 90° and a destination in Arizona, or possibly up in the Boulder Dam region. What other section of the country permits such diversified and uninterrupted flight training? Where else will you receive such valuable experience in all types of cross-country flying?

But RYAN training is not just a series of fascinating cross-country trips throughout the magic land of California and the Great Southwest. Between each week-end are 5 full days of intensive training, with daily maneuvers, formation flying and aerobatics on definite schedules and a regular daily program of ground school training that would be endorsed by any veteran pilot. . . For aviation is like bridge or golf—the better you understand it, the more enjoyable it becomes.

Naturally, the RYAN School uses modern equipment throughout. A fleet of open and closed airplanes, including Great Lakes Sport Trainers and Ryan Broughams, is at your command.

It is a significant fact that 90% of RYAN students are now graduating from Transport or Limited Commercial Courses.

You, too, may enjoy San Diego's famous winter flying weather by enrolling with RYAN now. Make your selection from one of the seven great RYAN courses, ranging from the economically popular *RYAN Transport Course plus your own new Great Lakes Sport Trainer Airplane for only $4460* to the Mechanic's Ground Course at $250.

NOTE: All training at RYAN is given by a corps of instructors under the personal supervision of T. Claude Ryan, original designer and builder of Ryan monoplanes; founder of Ryan Airlines and Ryan Flying Company; president of T. C. Ryan Flying School and T. C. Ryan Aeronautical Company.



( ) CHECK HERE For further information about the RYAN "Training — plus Plane" $4460 Course.

( ) CHECK HERE For information regarding Transport, Limited Commercial and Private Flying or the Master Mechanic's Ground Course, (underline which course).

The T. C. Ryan Flying School invites the attention of those who are interested only in the highest standards of aeronautical training. Ryan Approved Training costs less than training at some schools that have not been approved.

Courses include:

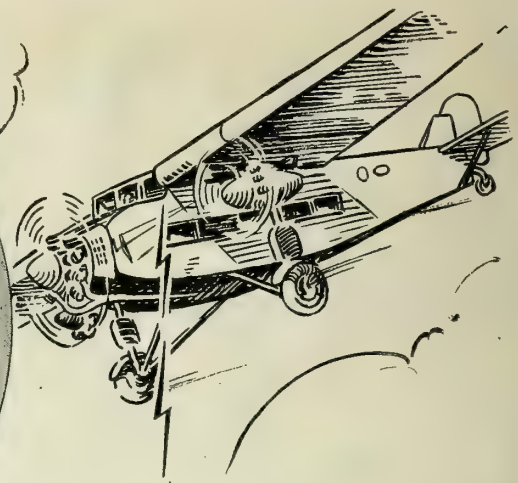
**The Transport Course . . . . . 200 Flying Hours*
**The Commercial Course . . . . . 50 Flying Hours*
†The Private Pilot's Course . . . . . 20 Flying Hours

Also *Refresher Courses for Wartime Pilots and those who have had flight training at other schools.*

**These courses include 400 hours of Ground School with Lectures, Laboratory and Shop Practice.*
†The Private Pilot's Course includes 200 hours of Ground School Training.

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Eliminates Ignition Interference

THIS new B. G. radio shielded spark plug—in conjunction with shielded magnetos and harness—eliminates all ignition interference; it keeps out dirt, water and oil, and gives positive contact.

Like other B. G. spark plugs, the new radio shielded plug is insulated with mica—the superior insulating material.

It has standard shell and core hexes, can be easily serviced with standard B. G. wrenches and tools, and assembled to harness without solder. Its terminal connections fit any make of shielded harness, and are interchangeable on all types of B. G. radio shielded spark plugs; elbow terminal prevents short-bend wear and tear on harness, is easily removed, and provides quick accessibility.

The Hornet size B. G. radio shielded spark plug has an overall length of 3" from cylinder gasket seat, and weighs only 3-1/16 ounces complete with terminal.

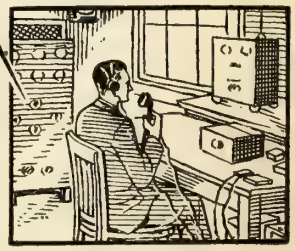
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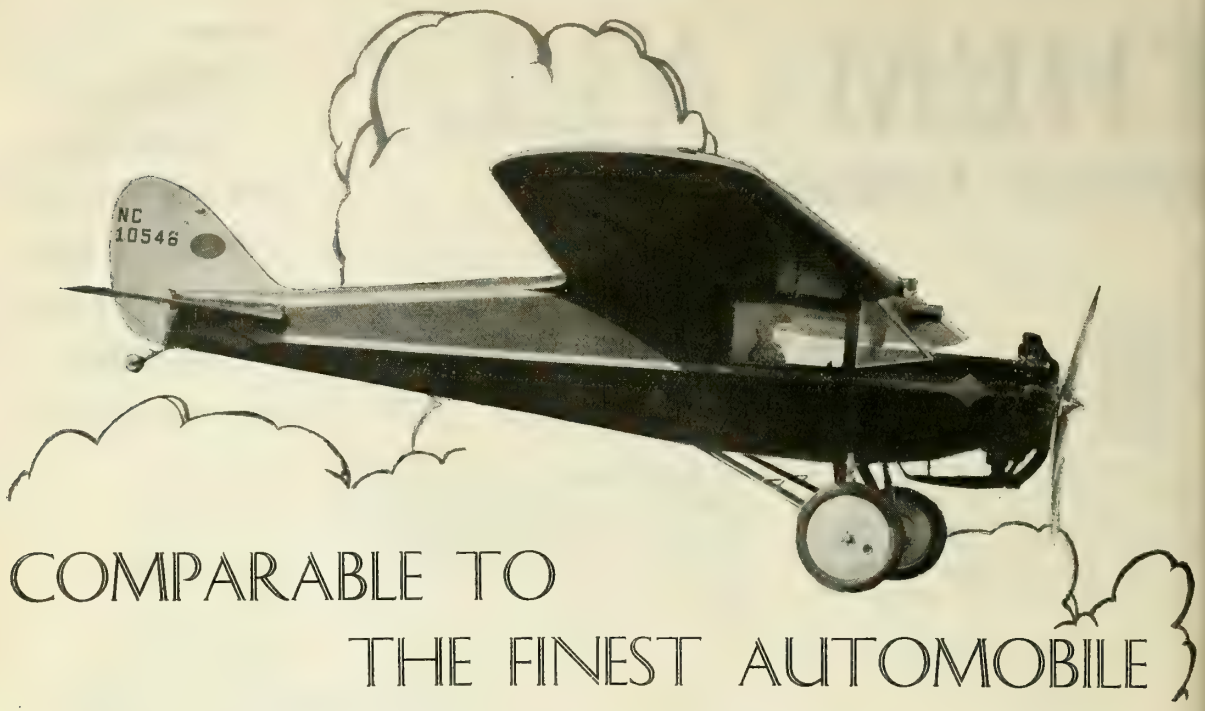
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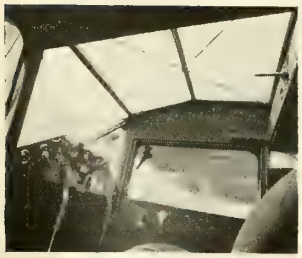
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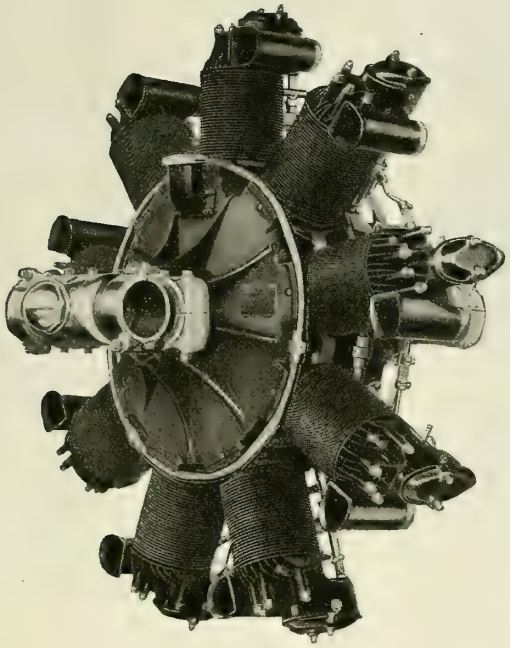
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Detroit

ASK THE MAN WHO OWNS ONE



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Thus the streams of sparks of the grinding room announce the Norton entry into the world of steel »» Norton grinding wheels and Norton grinding machines produced by Norton Company at Worcester, Massachusetts.

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Great Industries No. 2

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TO THE LAND OF THE KANGAROO IN THE



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Leaving Oakland, California, on May 31, 1928, they covered the 7,800 miles to Brisbane, Australia, in less than 85 flying hours . . . with intermediate landings on the tiny islands of Honolulu and Suva, Fiji Islands.

Important contributors to the success of this famous flight were the 54 Thompson Valves in the 3 Wright Whirlwind motors of the "Southern Cross."

Such consistent dependability, in this and practically every other outstanding American flight since 1925, has influenced the adoption of Thompson Valves for America's finest aero motors.

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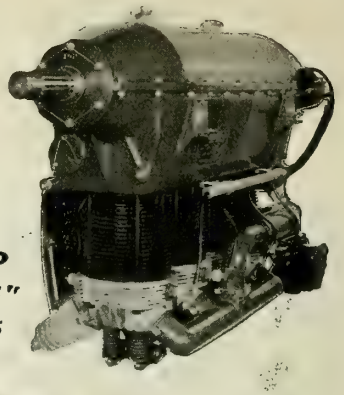
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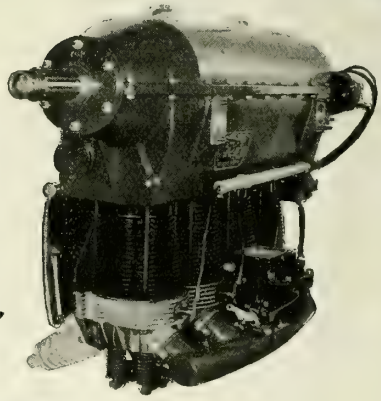
(This advertisement is one of a series recalling historic airplane flights in which Thompson Valves were used.)

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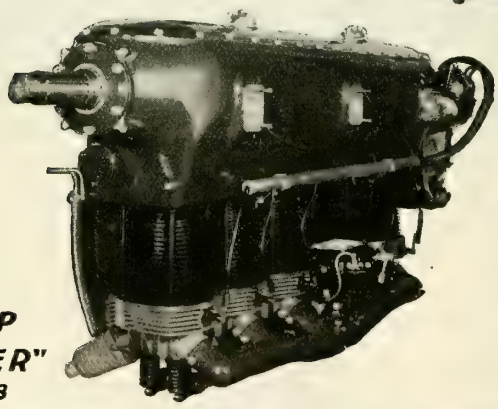
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A.T.C. NO. 67



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"BUCCANEER"
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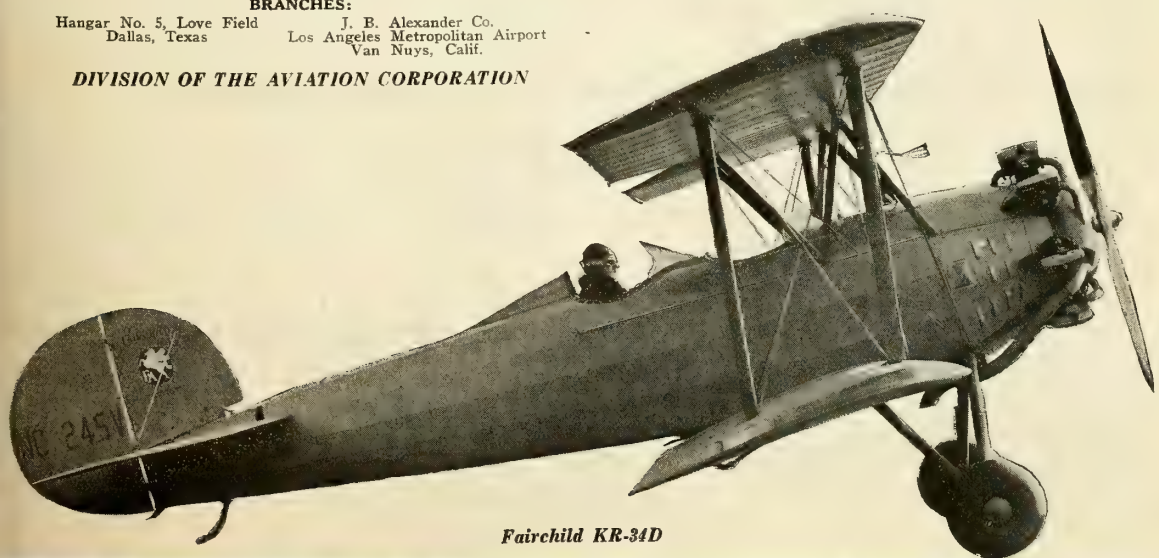
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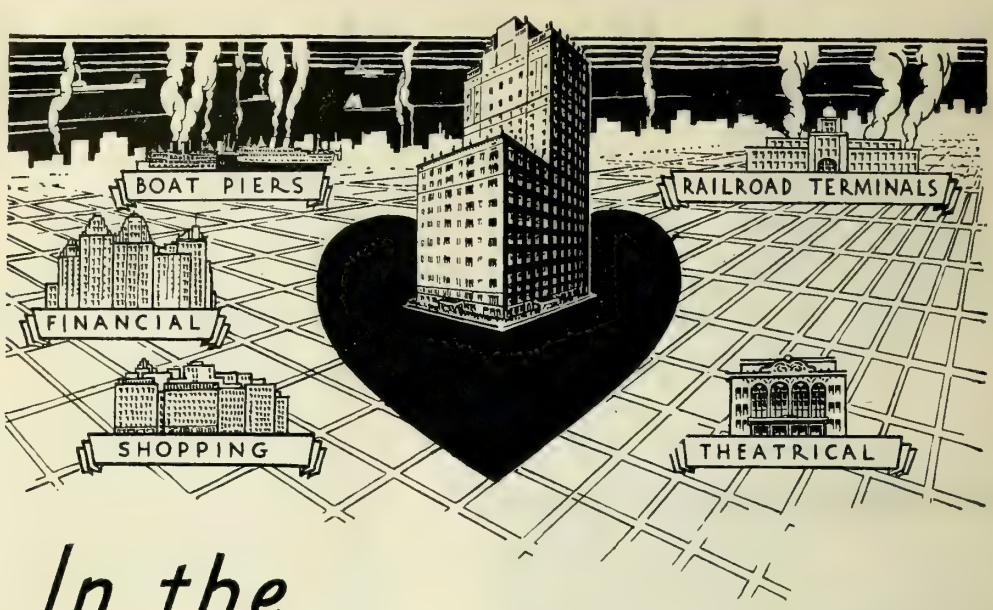
KR-21B Same model as KR-21 but has Kinner 125 hp. engine with increased performance. Low pressure tires and brakes included. Flyaway... **$4525.00**

KR-34D Three place taxi, sport and training Biplane. Comet 165 hp. engine. Completely equipped. Flyaway Factory **$5675.00**

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DOUGLAS AIRCRAFT CO.
Incorporated
Santa Monica, California




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Where PERFORMANCE TAKES PREFERENCE over PRICE



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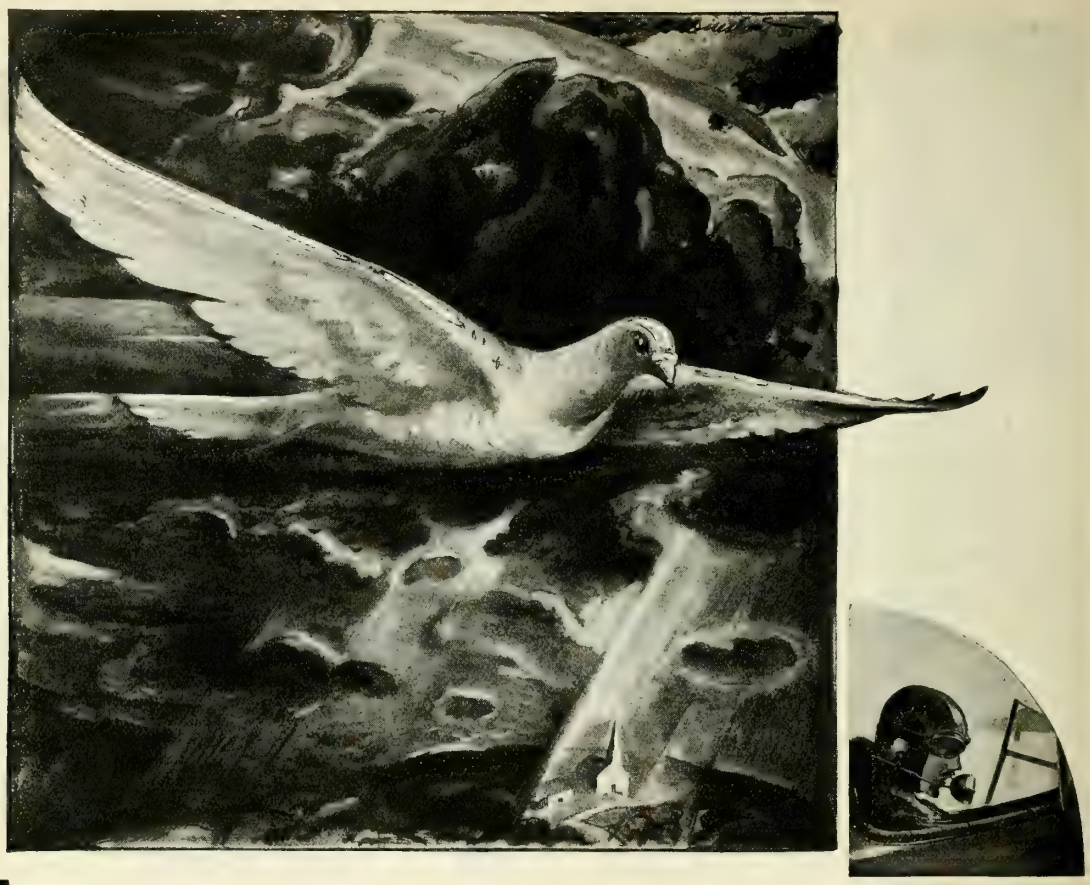
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SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

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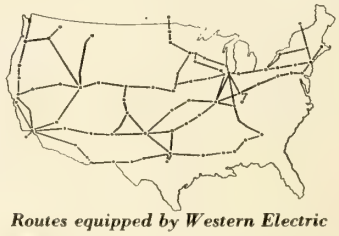
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A glimpse of the Pan American Airways terminal at San Juan, Porto Rico

PROCEDURE AND PERSONNEL OF THE PAN AMERICAN AIRWAYS SYSTEM

By Donald Duke

Assistant to the Chief Engineer
Pan American Airways, Inc.

WHEN the announcement was made early in 1929 that Pan American Airways, Inc., had been awarded a contract to transport air mail between Miami, Florida, and the Canal Zone, it was not at that time taken seriously by the public. Shortly afterward, however, the president of this new company announced that Colonel Charles A. Lindbergh, who had been appointed technical advisor, was scheduled to fly the first air mail to Panama. Colonel Lindbergh took off from Miami on February 4th on the inaugural flight. Since then four additional inaugural flights have been made by Colonel Lindbergh, each time extending the lines of the Pan American Airways System until the present total has reached 19,190 miles of established airways, with a weekly flight mileage of more than 90,000.

Veteran pilots, with years of service in the tropics, upon learning of this company's ambitious program, said that it could not be done. Scheduled flying in the tropics during the rainy season was thought impossible. Military planes had been forced down during torrential rain storms by weight of water falling on the wings, even with motors wide open. Magnetos could not be made to fire properly under such humid conditions. Propellers quickly became pitted, which caused excessive vibration. Engines could not possibly function properly in such weather. No landing fields were available, nor could they be established through the hundreds of miles of jungles, swamps, mountains and islands over which proposed routes were to operate. Dependable weather data along these routes were not to be had. Cable service was too slow to benefit aircraft operations, since, if the plane did get through, it would arrive ahead of the cable.

All of this was disheartening to say the least, but the contract had been accepted and the Postmaster General in Washington demanded action. There was small delay in starting scheduled mail flights, and after one year of almost perfect adherence to schedule came the announcement from the Postmaster General that Pan American Airways had accomplished its schedules with a percentage of 99.3 for the entire year—seven-tenths of one per cent short of perfect!



A canopied walk leads to the waiting plane at PAA stations

At this writing six months more have passed and the air route maps of Central and South America bear eloquent testimony to continued progress and development. Mile after mile of jungle foliage, turquoise waters of the Carribean, desert wastes, verdant sabanas, lofty mountain peaks and innumerable volcanoes still smouldering with the threat of further depredations are traversed daily by modern transport planes, modern both in equipment and convenience to the air traveling public.

Starting with the best planes and engines obtainable, experienced personnel and a plan of procedure characterized by exactitude and thoroughness, Pan American Airways has operated successfully in the face of seemingly insurmountable obstacles largely because of the rigid enforcement, by carefully selected and experienced personnel, of a policy requiring that every decision be based on "Safety First."

Air travelers of prominence in industrial and civil affairs have expressed wonderment that this company could assemble in such a short time and over such a wide expanse of territory, facilities and trained personnel equal to the fulfillment of the required operating standard.

The operating organization of the Pan American System provides for divisions similar to those of railway practice. A division operations manager is responsible to higher authority for the enforcement of policies governing flight operations. His staff of administrative and technical co-workers includes an assistant manager and chief pilot with division representatives for the engineering, airports, communications, meteorology, mail, purchasing and personnel departments. As a means of more effective administrative control and uniformity of operating procedure at each airport, the divisions are sub-divided into sections (usually 1,000 miles). Each section has a superintendent through whom control is exercised over field managers. The duties of the field manager are implied in his title. He is held solely responsible for the efficient and economical management of activities at his station. His co-workers are a field clerk; a chief mechanic, with one or more helpers; a chief radio operator, with one or more assistants; a porter, and a chauffeur. At terminal stations, the field manager's staff is augmented by necessary specialists as required to expedite prompt clearance of planes. The traffic department, the activities of which are broad in scope, functions as a separate unit and is not dealt with in this article.

Nowhere today is inexperience more potentially dangerous than in the pilot's seat of an airplane. Despite the prolonged and useless controversies as to the pilot's importance in the scheme of air transportation, PAA places at

the controls of its passenger airliners only conservative licensed pilots who have had at least 2,000 hours' (approximately seven years) flying experience officially credited and who have outgrown the desire to show off. The average officially credited flying time for senior pilots employed by Pan American Airways is well over 3,000 hours. A newly assigned pilot reporting for duty is required by the chief pilot of the division concerned to submit credentials in proof of his graduation from an accredited flying school, total flying time, types of planes flown, night flying and trimotor experience. His Department of Commerce license is checked against type of equipment to be flown and to insure that his physical condition is up to the standard required. He is then indoctrinated as to company operating policy and given an operations manual to study. Conduct, neatness and appearance of the highest standard are emphasized as essential attributes co-equal with skill in flying, navigating and handling the plane. The first rule in the operations manual is "Safety First," and this policy permeates throughout the organization even to the most trivial activity of the ground personnel. The second rule is comfort of passengers and courtesy shown. Nothing must be taken for granted. Not only are pilots required by regulations to assure themselves that the planes they fly are in proper condition, but they also are required to make a personal check of the fuel and oil in the plane before taking off. Convenient measuring sticks are provided for this purpose, since registering gauges of present manufacture are not sufficiently accurate to be trustworthy.

The chief pilot is responsible for every pilot he assigns to a scheduled route. He demands concrete proof of flying ability, as well as character, before "checking out" newly assigned pilots. As a further precaution against accidents, no pilot is assigned as senior pilot in charge of a scheduled flight until he has had at least 300 hours in the type of plane to be used and has made five complete trips over the route assigned. Regardless of previous experience, these rules are adhered to. Pay for this service must necessarily be and is commensurate with the high standard of performance required.

Instruction in instrument flying is an important part of the curriculum of every PAA pilot. Small single-engined cabin planes equipped with special instruments and a blinded rear compartment for the pilot receiving instruction are used for this purpose. The present course of training includes ground instruction on the theory and use of instruments for the primary purpose of proving that physical senses do deceive the pilot when flying blind. This is followed by air work as indicated:

Thirty minutes—level flying in smooth air.
Thirty minutes—on given course in smooth air; nose up and nose down.
Thirty minutes—level flying in rough air.
Thirty minutes—on given course in rough air; nose up and nose down.
Thirty minutes—ninety-degree by 180-degree turns in smooth air.
Thirty minutes—ninety-degree by 180-degree turns in rough air.
Thirty minutes—practice climb and glide and 180-degree turns.
Thirty minutes—climb to 5,000 feet and recover from unusual positions.
One hour—cross-country over given course, correcting for wind drift, variation, deviation, etc.

Specifications of both fuel and oil are high, and only those grades are used which come up to requirements. Every airport sends samples of each shipment in specially prepared containers to Miami where special equipment



Pan American Airways ground stations maintain radio contact with planes within a 600-mile area

is available for exhaustive test, including knock rating. Under no circumstances is gas from a new shipment used until the report from Miami pronounces it acceptable. Heavy rains and tropical heat cause excessive condensation in gasoline storage containers, and consequently, as a pre-

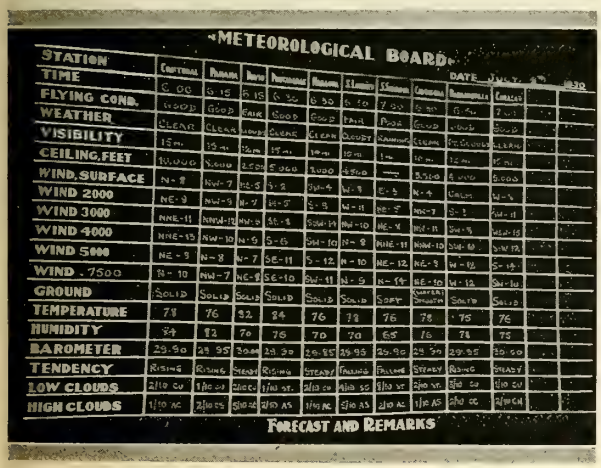


Nose hangars protect the engines of Pan American Ford trimotors at Managua, Nicaragua, on the Mexican division



The passenger station at Tampico, Mexico, is typical of others of the Pan American Airways System

caution against water in the fuel tanks of planes, frequent tests are required at all stations to determine the water content. These tests are made by attaching litmus paper strips to a specially prepared stick which is then forced slowly to the lowest point of the container. This test is unfailing in



Weather reports for a division are posted on the headquarters' blackboard as they are received by radio telegraph

showing the exact proportion of water, if any. Benzol mixtures were previously experimented with, but the grade of gasoline now being obtained gives best performance without doping or other treatment. At intermediate stations, planes are gassed only under the personal supervision of the chief mechanic and the co-pilot. Through the use of double pumps, 250 gallons can be filtered through chamois into the plane's tanks in twelve minutes. In this manner, refueling delays are held to a minimum, making it possible to increase the scheduled mileage flown daily. When it is realized that the flying done by Pan American Airways planes in one week requires 50,000 gallons of gasoline, one can appreciate that the labor and clerical work involved in shipping, handling and recording such a quantity of gas is a gigantic undertaking in itself. The inaccessibility of many airports makes this problem more difficult and correspondingly costly.

The dependability of PAA's radio and the exacting maintenance requirements, have contributed most to the commendable record of scheduled regularity. Neither factor could be sacrificed with impunity.

Two-way radio that is quick, dependable and positive, enables the pilot and co-pilot of each plane to keep in constant communication with stations both ahead and behind, as well as with terminals or base airports. Licensed flight radio operators, with ear phones constantly adjusted, remain at their sets with the same degree of alertness required of the two pilots.

Field managers and the operations manager's staff at headquarters are kept constantly informed of arrivals, departures and movement of all planes in the division, as well as planes of other divisions which are to make scheduled connections. With a radio system that is independent of outside sources of power supply or operation, officials of the company have at their command a communications network that has proved indispensable to flight control and equal to every emergency. For example, from Cristobal, where one of the most important bases is located, the exchange of messages with planes in the air or with officials in Mexico City, Miami, New York, San Juan or Trinidad is accomplished quickly and accurately.

By means of large wall maps, operations managers know with certainty at all times the position of planes and progress they are making. Scheduled arrivals and departures at all intermediate stations are followed, and specific instructions radioed directly to pilots or field managers when necessary. With each new radio position report, the small miniature planes are moved along tracks to the location indicated in the message. By checking the position reported against the time sent, all concerned know the approximate arrival time of expected planes. Field managers have similar, though smaller, maps which serve the same purpose for their particular routes and thus facilitate flight control within their section.

Other messages forwarded by the pilot in advance of arrival at stations include names of and necessary information regarding passengers aboard, making it possible to arrange for customs and inspecting officers to be waiting upon arrival of the plane in compliance with the strict regulations of Latin-American countries, and in this manner needless delays in releasing passengers and clearing the plane for the next station are obviated.

No expense has been spared in providing each station with a complete set of standard meteorological instruments, consisting of a barograph for determining the atmospheric pressure, an anemometer for determining the surface wind force, a psychrometer for determining air temperature and relative humidity, and a gauge for recording daily rain fall.

(*Continued on page* 119)

CHEER UP! GOOD TIMES ARE COMING

by Caldwell

LAST month when the gong sounded on my allotment of space in AERO DIGEST, I went to my corner with the remark, "Cheer up!—Good times are coming!" The effect of this optimistic statement was startling, for my six stalwart readers no more expect optimism from me than they expect merry laughter from a soft-shelled crab or a rhinoceros.

Optimism, in fact, is not in me. I give headroom neither for optimism nor pessimism, for I regard both as mental extremes, equally impotent to change the hard facts of existence. Which is not to say that feeling hopeful is not a more desirable mental condition than feeling hopeless. But no chosen *mental* outlook of yours or mine alters the *facts* confronting us. We may feel hopeful or hopeless, happy or miserable, but the facts of life, like the facts of aviation, remain as they are until we get to work and change them. Our feelings about them, one way or the other, are ineffective to accomplish any change, except in ourselves.

Standing firm in this belief, I try always to see things as they are—not merely as I might wish them to be. A year ago, for instance, a study of facts convinced me that aviation, in company with other industries, was in for a year or so of quiet suffering. I listened to the rosy predictions about business picking up soon, and hoped that the optimists were right and that I was wrong. Meanwhile I regarded the facts, drew but little comfort from them, and settled down to wait for a number of things, among which were: the Watres Act which formulated a more satisfactory basis of compensation for mail contractors; the folding up and stealing away of a number of unsound aeronautical ventures; the gradual elimination of bold and silly flights staged solely for personal publicity purposes; the gradual reduction of crashes caused by bad weather flying, stunts, and stupidity; and last—but by no means least—an upturn in general business.

The gong sounds again! And Battling Cy rushes in for another round with that persistent challenger, Pessimism. It's a fight to the finish, with the pugnacious Caldwell getting through with a knockout wallop.

All of these things for which I was waiting—with the exception of the upturn in general business—have now arrived, in whole or in part. The Watres Act is functioning; many unsound ventures have gone where the woodbine twineth, and others are on their way; the personal publicity flights are greatly diminished in number by an increase in common sense and a decrease in the amount of money in the hands of those who don't know what sensible thing to do with it; and the number of crashes caused by over-bold and ill-judged flying has been lowered.

In my opinion, the present condition of aviation is more basically sound—even though less wildly happy—than it ever has been in the United States. And it is my firm belief, founded upon what I recognize as facts, that aviation is about to enter upon a period of sound development and reasonable prosperity compared to which the feverish furore of the last three years will appear in retrospect in their true light—as the coltish cavortings of a healthy youngster, full of the vim, vigor, and vitality, but not then possessed of the mature judgment and discretion that comes only with years. Time, tough but kind old teacher of us all, is thrusting those sense-gathering years upon us; and we enter 1931 minus a great deal of our childishness, and plus some mature experience. In short, aviation at last has arrived at voting age.

IN last month's article I pointed out that some Moses always has appeared to lead us forward, and that a new one had appeared already, although he had not yet revealed himself to all. Of course, we have known for some time that he was due, even over-due; and we have looked around hopefully, expecting any moment to see him.

Like the first Moses of the Scriptures, our Moses always comes from a strange source—usually from the bullrushes, with the accent on the first syllable. He pops up at the most unexpected times, in the most unexpected disguise. Who, for instance, foresaw the war and its effect upon aviation? Who foresaw Charles Augustus Moses and his emotional effect upon the palpitating populace? Likewise, who foresaw the appearance of good old Moses number eight, whose sandals now clatter upon the staircase? In fact, he has arrived from a direction that I did not expect, and in garments strange to me. But let him wait on the landing while we look at those facts of 1930 on which I base my predictions.

In 1930 we were still awaiting Moses, peering at every face with the hope that it might be his. But finally I gave up looking for him and turned my attention to the facts of 1930 to see if perchance I could gain any hope from them. And what I gleaned leads me to predict a new era of sound development. Please note that when I write "sound" development I do not mean the babel of voices that have dinned on our ears in the past. I mean sound in the sense described by Webster's Unabridged as "Having all the organs and faculties complete and in normal action and relation; holding correct views, or following correct processes of thought," and so on.

And when I use the word "development" I use it as defined by Webster: "Gradual evolution or advance; an internal or subjective expansion or process toward a more perfect state; *gradual* growth or enlargement."

I define my predictions thus carefully, lest one of my six weary readers, perusing this carelessly, may go away with the impression that I expect an immediate recurrence of the insanities and inanities of 1928 and '29. I hope never to see them again, for they are hurtful and not sound. And now for the facts of 1930, upon which I found my predictions.

(*Continued on page* 136)

THE MENACE OF F O G

By Martin L. Dobler

Member, American Meteorological Society

FOG constitutes one of the greatest natural hazards and obstacles with which the airplane must contend. Therefore, perhaps the most valuable knowledge a pilot can acquire is that which will aid him in avoiding conditions likely to produce fog.

Especially along the Atlantic Seaboard and over the Appalachian Mountain range, there are frequent and sometimes unexpected fogs. In those regions, therefore, it is particularly advisable to guard against all shallow and weak barometric depressions which may move slowly up the Atlantic Coast or inland over the Blue Ridge and Allegheny Mountains, especially when an area of high barometer of but moderate intensity overlies the Northeast, either in eastern Canada or the New England states.

Fogs are caused by an inflow of warm humid air from over the Atlantic Ocean to a cooler drier land surface where the vapor of the air condenses as it is chilled by the lower temperatures prevailing inland.

The depth of these fog banks may vary considerably—from several hundred feet they may extend (according to Captain Wolfgang von Gronau's experience) to heights of 4,500 feet, out at sea. The average fog bank, we are safe in saying, extends up to the 1,000 or 2,000-foot levels. Sometimes, in the fall and winter seasons, these banks persist over our Middle Atlantic and New England states even several days at a time. During such periods the weather map shows very little change from day to day, and the barometer remains high over the East or Northeast and low to the south of us.

Since the wind circulation flows spirally outward (clockwise) from an area of high barometer and thence spirally inward (anti-clockwise) towards an area of low barometer, it is readily apparent that along the Atlantic Coast an area of relatively low pressure advancing slowly northeastward continuously draws in from the ocean a supply of warm, moist, fog-bearing air. Therefore, until a great area of high barometer invades the Piedmont sections from the west or northwest, the pilot should exercise great caution.

Pilots should always remember, too, that where the isobars are crowded close together on the weather maps,—in other words, when a northeast storm of considerable intensity is advancing up the coast—this great atmospheric activity will not allow fogs much chance to form, because the air is in constant motion. But the flier should nevertheless guard against the misty rains and low ceiling clouds which accompany the "Northeaster."

During the colder months, the fogs become denser, a phenomenon we can readily understand if we consider the fact that the temperatures of adjacent water areas are considerably higher than colder inland sections.

Another type of fog is the "ground fog" in the Appalachian Mountains, which is caused by radiation on clear cool nights and which forms the well-known "mountain fog" of early morning which is gradually absorbed by the warming rays of the rising sun. These "ground fogs" may also extend at times to 1,000 or even 2,000 feet, although as a rule they are confined to the valleys in these mountainous districts and usually disappear an hour or so after sunrise.



Acme—P & A Photo

An Imperial Airways plane is balked by fog and turns back to its Croydon hangar until the enemy disperses.

The fog producing surface winds of the Atlantic Seaboard states are those from the northeast, the east and the southeast. Occasionally winds from southerly directions have this effect, especially in the New York and Long Island areas.

Most all Eastern pilots have witnessed how quickly a great fog bank can start "rolling in" over a chilled area out on Long Island along the south shore. This phenomenon is usually caused simply by the shifting of the center of a marked area of high pressure somewhere over the New England coast. During the presence of a high area of this type, pilots can be warned by any slight rise in the barometer, with a shift of wind to an easterly or southerly direction. Such changes indicate a southward movement of the "center of the high" and a consequent in-rush of fog banks along the coast of Long Island and New Jersey.

There is no need for the pilot to worry when an area of low barometer is moving out to sea down the St. Lawrence Valley, and is closely followed by an energetic area of high barometer of 30.4 inches or higher, because then it is that visibility will be almost unlimited, and the cloud ceiling high. What few following clouds there are will be of the "strato-cumulus" variety.

Fogs "hibernate," so to speak, to the east and northeast of sluggish indefinite areas of low barometer which may form over the mountains of Tennessee or West Virginia and in the lower Shenandoah Valley of Virginia. Under those conditions a pilot should carefully study his weather map before attempting to cross the Great Smoky or Allegheny ranges, for he is extremely likely to encounter dangerous low ceiling clouds considerably below the mountain tops. And there is also the possibility of dense fog banks throughout the area. Light winds of but five to ten miles per hour usually accompany these low barometer areas.

In conclusion, beware when the weather map shows the isobars to be far apart over the Southern states, or when a moderate area of high barometer overlies the New England or Middle Atlantic states.

AIR PIONEERS OF THE WEST

By

Fowler W. Barker

Photographs by courtesy of Ivan R. Gates

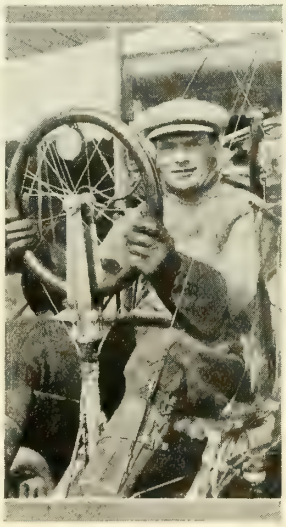
AVIATION on the Pacific Coast has a heritage—a background of pioneering—and its progress has proved that the pioneers did not work in vain. Its history may be divided into four periods, including the pre-war period with which are identified the names of Montgomery, Fowler, the Beacheys, the Christoffersons, Glenn Martin and Art Smith; then the war years with Mather and Rockwell Fields and the School of Military Aeronautics at Berkeley; the years following the war with their barnstormers; and the more or less flush period of aircraft factories and de luxe airlines since May, 1927, when Lindbergh hopped to Paris.

Probably the first Pacific Coast aviation enthusiast was Father Montgomery of Santa Clara College. In the early twentieth century he built and experimented with a tandem monoplane glider with flexing wing tips, and is said to be the first person to use a cellulous dope on fabric covering. Shortly after the Wright brothers' first flight in a power-driven plane Montgomery's glider took off from a hill near Santa Clara and soared to an easy landing on another hill of higher elevation. Reports have it that the venerable aero-theologist was in the habit of sending his glider and pilot aloft attached to a balloon. After one such ascent Maloney, the pilot, is said to have barrel rolled on the way down. Whether this maneuver was executed unwittingly or intentionally is not known, but if certain observers are to be believed, Maloney did the first barrel roll on record—or perhaps it was the first spin.

Bob Fowler, the dean of early Pacific Coast aviators, subsidized his flights by a garage business at Gilroy and, after several unsuccessful attempts, was the first to fly across the continent from west to east. This was in February, 1912. He now lives in San Jose, and although not any longer an active pilot, his work for aeronautics has been continuous.

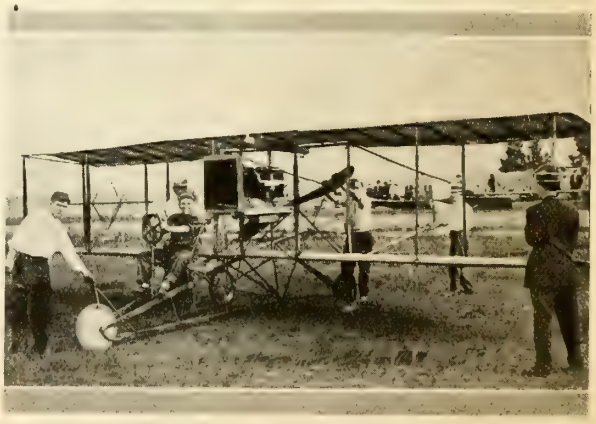
As early as 1913 the late Silas Christofferson flew from Los Angeles to San Francisco in his Curtiss pusher. His flight training was entirely of the self-taught variety. Some of us who have tried to teach our wives to drive the family car honor the name of Christofferson if for no other reason than that he taught his wife to fly. Mrs. Edna Christofferson is now an admired resident of Portland. Among Mr. Christofferson's accomplishments was the first flight from the roof of a downtown building. This was from the Multnomah Hotel, in Portland, in 1912. His brother Harry was also an early West Coast pilot.

A race between several aviators and Barney Oldfield was held at the old Emeryville race track near Oakland in 1910. It is suspected that Oldfield, in order to make the show as spectacular as possible, did not drive his car to its limit. Imagine an automobile slowing down for an airplane nowadays. The pilots at this show are not remembered by name, nor does questioning and research divulge who they were. It is logical, however, that Lincoln Beachey, and perhaps his brother Hillary, Silas Christofferson, Frank Bryant, Farnum Fish, the Frenchmen Herbert Latham and Louis Paulhan, and Roy M. Francis may have been listed on the program. Lincoln Beachey was, of course, well known throughout the country and particularly to Californians during the San Francisco Fair. Christofferson's well justified claims to fame have been mentioned. Frank Bryant and Roy Francis, operating from the vicinity of San Mateo, were early users of tail control surface instead of the Wright brothers' system of forward outrigger elevator control. They built their own machines (single-engined double tractors) and flew generally throughout the state, wherever the occasion called for a thrill purveyor. In

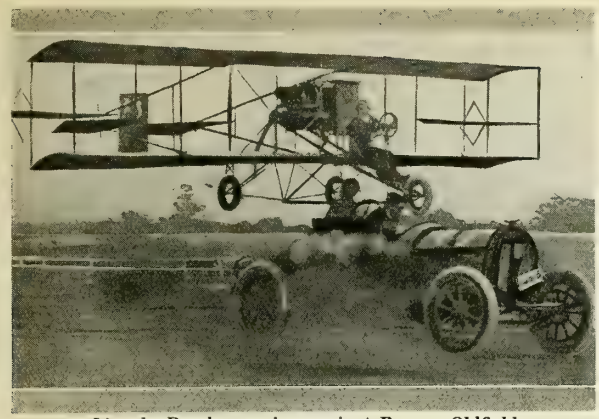


Didier Masson

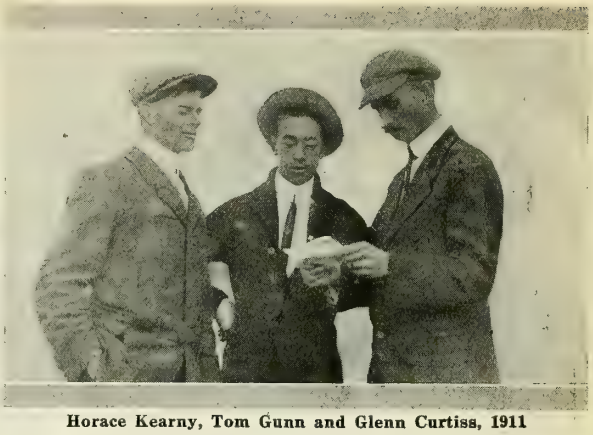




Christofferson breaking toy balloons eighteen inches from the ground; "Bird Boy" Art Smith in his famous Curtiss pusher



Lincoln Beachey racing against Barney Oldfield



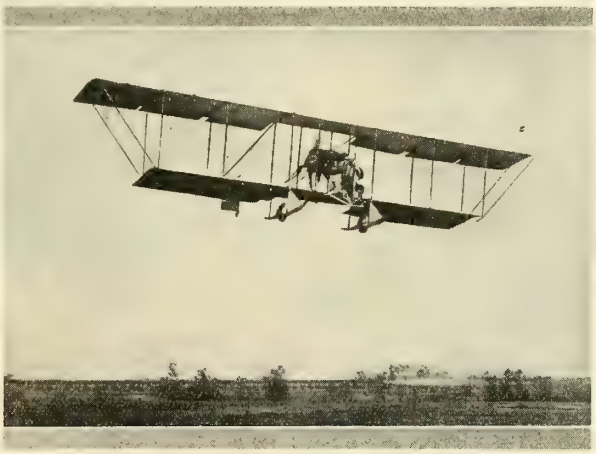
Horace Kearny, Tom Gunn and Glenn Curtiss, 1911

those days a twenty-degree bank during a left turn was a stunt.

It was in 1911 that the first Selfridge Field was established near the Tanforan race track in the approximate location of the present Mills Field. Named after Lieut. George Selfridge, the field was the site of several air meets of international scope so far as participants and planes were concerned.

Paulhan flew his Farman there, and Latham, his Antoinette monoplane with its unusual V-type fuel injection engine. An Englishman, whose name I cannot recall, was the star of the meet because of his masterful handling of a cross-Channel type Blériot. At one of the Tanforan meets, Lincoln Beachey used a Santos-Dumont monoplane with a belt-driven prop.

Those were the days when rubberized fabric covering was tacked on the ribs and the outriggers were often of bamboo. Hall-Scott engines (40's and 60's) eight-cylinder water-cooled jobs, were considered the last word by West Coast pilots, and they were exceptional, antedating as they did the use of this type engine in automobiles.



First plane built by Ivan R. Gates in California

It was in 1911 that Glenn Curtiss started his school at San Diego, where many famous early aviators were turned out. Elmer Sperry learned to fly with Curtiss and experimented at North Island with his father's gyroscopic device in a Curtiss seaplane. The site of the old Curtiss "course" has been expanded and is now embodied in the Navy air base at San Diego. Bert Acosta was a mechanic and later a flying instructor there; and Jimmy Johnson, now of the Buhl Aircraft Company and ex-test pilot at Dayton, learned to fly at the Curtiss school. Glenn L. Martin was active in Southern California as a designer, builder and pilot, and in 1913 was the first to fly from mainland to Catalina.

Who remembers Tom Gunn, the Chinese aviator who, after cracking up numerous wrecks and thereby saving the lives of other would-be aviators, left California for China to become the Eddie Stinson of that country? Katherine Stinson, by the way, made one of the early hops from Los Angeles to San Francisco.

Farnum Fish, the boy aviator from Southern California, did a lot of flying at meets throughout the state. He used a Wright Model B with an engine also made by the famous brothers of that name. There was a chap by the name of Parmalee who was active as a pilot of miscellaneous junk, as the planes would be considered today. But the prize feat of them all—a feat which has never been duplicated—was when a certain L. Beachey took off and landed within a building. This was in the huge Transportation Building of the P. P. I. E. before the San Francisco exposition opened officially.

Who active in aeronautics today remembers when Eugene Ely flew off the specially platformed quarter-deck of the cruiser *Pennsylvania* anchored in San Francisco Bay? Or when Charley Day—designer of the famous Standard J1 and present New Standard—built his first job which was flown by a pilot named Masson from the San Raefel marsh?

The end of the pre-war period may be illustrated by the flying that took place during the Panama Pacific International Exposition in 1915 where young Art Smith took Lincoln Beachey's job as official aviator after the latter's death. Art Smith, even back in 1915, did sky writing and at night, too. San Francisco took this youngster to its heart as it had Lincoln Beachey. A local newspaper ran a serial on "The Life of Art Smith," believed to be the forerunner of the numerous subsequent biographies of flights and fliers, which have caused so many wide-eyed youths to enter aviation. Lincoln Beachey and Art Smith were the inspiration for many of our well-known aviators of today. Mention should be made of Adolph Sutro, scion of a prominent San Francisco family, who had a twin-tractor seaplane, which he designed, built and flew off the bay for several years prior to the advent

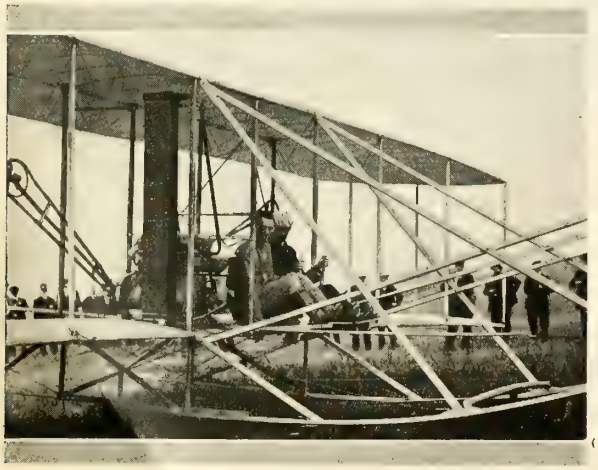


Harvey Crawford, designer and pilot of his own plane

of Beachey and Smith, and their rise to fame as "intrepid birdmen."

With the war entered a period of mass education in aeronautics. The Army ground school at Berkeley, Government fields at Sacramento, Los Angeles and San Diego, trained men who later furnished personnel for the numerous commercial aviation enterprises of the West Coast. There was at that time no appreciable production of complete airplanes on the coast. The Northwest, of course, furnished the major part of the airplane spruce for Eastern factories, and this fact was undoubtedly the reason for the establishment in Seattle of what has become one of the largest airplane factories in the world.

After the armistice there were literally thousands of aviators and war-surplus Jennies and Standards which were on the open market for one-tenth and less of their cost. Some military aviators had not had enough of flying. Then started the barnstorming era. There developed the daredevils such as the late Omer Locklear, who is credited with starting wing walking and plane changing. Anything to gather a crowd from which pay passengers could be obtained. Major Kenneth Marr took his flying circus from Bakersfield up into Oregon and Washington. It was typical of the barnstorming groups operating in the United States. This circus consisted of two Canuck Jennies and one Martin (engine unknown but believed to have been a Hall-Scott) for four passengers and pilot. After arrival at Chehalis, Washington, the Martin seldom got off the ground. One Jennie cracked up in taking off from the fair grounds. The circus disbanded.



Lieut. George Selfridge and Orville Wright in 1908

Ivan Gates started from San Francisco and barnstormed up through northern California and Oregon with a Hispano-Suiza 150-horsepower Standard. He worked his way east gathering momentum en route in business and additional airplanes until he had, with a dozen planes, one of the greatest flying circuses of all time. The famous Gates flying troupers have carried passengers in every state in the Union.

There were tragedies in connection with barnstorming, but remarkably few accidents to passengers. "Swede" Meyerhoffer dropped circulars over each town before he landed for business. They read to the effect that "Aviators may come and aviators may go, but the Swede flies on forever." This was true, for "Swede" had flown for ten years. One day in southern Oregon he slipped when swinging his propeller. And flew no more.



Roy M. Francis

In those days passengers were charged ten dollars apiece for a short hop. In 1922 the charges dropped, and when they cut short hops lower than five dollars, I for one got out of the business. Without meaning to inject too much autobiography in this article, I believe an incident of a trip to Ontario in eastern Oregon to fly during the Malheur County Fair may be of interest. This was in the summer of 1920 and a Lincoln Standard belonging to the La Grande Aircraft Company was flown from Bend, Oregon, upon receipt of a telegram offering a hundred dollars a day to fly an exhibition show for the three days of the fair with the privilege of carrying passengers at what we could get.

There were two pilots who wanted to go. We took but one of the two ships at Bend, and George Love, the manager of the company, went with us. Rechsteiner, the other pilot, and I tossed up to see who would fly the first stage from Bend to Burns—a distance of about 120 miles. We had not been to Burns before and knew nothing about landing fields in the vicinity. Fortunately, there was a good level pasture and it was easy getting down. After gassing up—there was no such thing as aviation gas at Burns—Love and I got in the front seat and Rex took the controls. It was clouding up. We had to get to Ontario to fill our engagement. We ran through several snow storns and a hail storm. On reaching Ontario we located the race track where we had been advised to land. It was too small and besides was full of horses, steers and buckaroos in addition to a deflated balloon and its accoutrements, all of which presented too much of an obstacle, even if the area had been sufficiently large. Then followed

a half hour of flying around Ontario looking for a place to land. It was raining hard. We figured that our gas supply was about exhausted because of the storms and head winds east of Burns. Love and I pointed down to a couple of likely landing places. Rex ignored us. Finally he landed on the lawn in front of the high school. After gassing up, it was my job to fly one of the fair officials—it was raining harder—while he dropped circulars over Vale, Oregon; Payette, Idaho, and other towns in the vicinity.

We found it impossible to fly any passengers from the high school lawn. Nor could we locate a better landing place. For the three days following we did exhibition flights consisting of wing overs, sloppy barrel rolls and spins over the grandstand, Rex winning the toss up and the job of doing two of the shows and I one. We were told that our plane was the first one seen in Malheur County since eight years before when Silas Christofferson was there. He used the race track; we couldn't, so we were not so hot. Our hats were off to Christofferson; he was a real pioneer. Although we had no airport, we had a strong ship with a reliable engine, and our stuff had been done thousands of times before. Our predecessor was doing something about which there was only the slightest degree of certainty.



Earle Ovington

Some air transport activity started in 1920 in the Pacific Northwest when the Oregon, Washington and Idaho Airplane Company operated Curtiss seaplanes from Portland to summer resorts on the coast below the mouth of the Columbia River. These planes carried newspapers under contract as well as frequent passengers. Regular schedule was maintained. Victor Vernon, now of Colonial Airways, had charge of this outfit. A year earlier the late Edward Hubbard started an airline from Seattle to Victoria which marked the first American line carrying mail internationally. Mr. Hubbard used a Boeing seaplane and was destined to become a figure in the operations management of the extensive Boeing transport system before his death.

Another development came about this time when Claude Ryan of San Diego started his line between that city and Los Angeles. He graduated from that business to the manufacture of a rather famous airplane. In the summer and winter of 1921 there was a flying school in Portland operated by the Dudrey Aircraft Corporation. A year previous to that Oliver K. Jeffrey of Portland imported three Avro planes from England, one of which was sold to a Mr. Peters, who is believed to be the first pilot to qualify for the Aero Club Certificate in the Pacific Northwest. A Canadian war ace named McClurg and I flew for both Jeffrey and Dudrey. Walter Lees, who now flies the Diesel-engined plane for the Packard Motor Company, Archy Roth, Merrill Briggs and Shorty Evans, not to forget Art MacKenzie, were all active as aviators around Portland a decade ago. Danny Grecco, now of the Rankin



Lincoln Beachey, one of the most skillful of the early pilots

school in Portland, was the best mechanic in those parts, and could tune up an OX-5 to perfection.

There were numerous others whom I did not know personally. The two Earls of Los Angeles and suburbs, Dougherty (the world's best Jenny pilot) and Earle Ovington, the first pilot to fly U. S. air mail—their fame had spread to Corvallis where I was barnstorming my way through cow college. Nick Mamer was at Spokane, and Tex Rankin was barnstorming around somewhere but had not yet located in Portland. California had numerous fixed base operators, including Varney of the now famous airline, who sold out to "Speed" Johnson at San Mateo, and Emory Rogers at Los Angeles. Lawrence Brown, who later flew in Honduras, was famous then also with his Curtiss Oriole. He flew all over the coast states from Walla Walla to Tia Juana. Christopher Pickup used to fly to all points from Oakland with Cliff Durant and his Hall-Scott Standard, and Lowell Smith of subsequent Army 'round-the-world flight fame was a familiar figure flying the forest patrol in northern California and central Oregon. Aeronautics Branch Inspector Jim Kinney, who soled a Curtiss pusher before the war, demonstrated and sold many a Lincoln Standard in California. He was the aeronautic industry's first Sales Engi- (*Continued on page* 120)



Mrs. and Mr. Silas Christofferson and their dual control plane



The apex of General Balbo's double triangle which spanned the South Atlantic in formation. Photo courtesy Stanavo.

ITALY to BRAZIL

6450-MILE FORMATION FLIGHT

Gertrude Thornhill

GENERAL ITALO BALBO'S great venture is finished and another significant chapter added to the history of aviation. For despite the loss of five lives and three planes, the seven-stage hop recently undertaken by the Minister of Aeronautics of Italy and his squadron of fourteen Savoia-Marchetti S-55 flying boats from Orbetello, Italy, to Natal, Brazil, is considered a success.

When the squadron reached Rio de Janeiro, it had finished 6,450 miles of flight in formation over three continents, the Mediterranean Sea and Atlantic Ocean and brought to completion the plan of the young flight leader for the most ambitious flight of a group of military planes ever undertaken.

The flight was accomplished under unusual difficulties, which make the results even more definitive in experience gained. Each plane, powered by two 500-horsepower Fiat engines and manned by a crew of four, was loaded at the take-off with a weight of 4,600 pounds or slightly more than a third greater than the maximum loads ordinarily carried by flying boats of 1,000 horsepower. The ships had been tested under these loading conditions, and every indication was that they would rise. Nevertheless, the take-off of the heavily loaded planes in the dark was the crucial moment of the undertaking and the stage in which tragedy overtook the flight. Shortly after the take-off two planes crashed, one disappearing with the entire crew. The Minister of Aeronautics, in his account to Premier Mussolini, explained that it was possible that since the machines carried both lighting plant and radio the accident might have been caused by a short circuit. On the other hand, it might also be attributed to one of those inexplicable occurrences that can easily happen when the limits of normal functions of aircraft have been exceeded.



General Italo Balbo, Italian Air Minister

The take-off was also made under unfavorable weather conditions. After several days delay waiting for more favorable weather, the squadron was compelled to take-off if it was to take advantage of a full moon. It was completely dark when the squadron took off from Bolama at 1:30 in the morning. With the surface of the water obscured, the pilots were forced to calculate their altitude by setting their altimeters just as the ships rose from the water and trusting to their accuracy. Frequently the pilots were forced to fly through clouds that obscured both sky and sea. Only the lights on the wings of the other ships showed through the mist.

The formation flying of the venture presented one of its most interesting features. It was a thorough test of the engines in view of the fact that to keep formation it was essential that the engines be not only perfectly sychronized but equally efficient. It was also a test of the skill and stamina of the pilots. The men at the controls developed a supernatural ability to keep their eyes fixed unwaveringly on the instrument board and still see the planes above and to the side. This extraordinary mobilization of nerve force approached hysteria, Balbo said. Indeed, the Minister declared that he would rather fly the ocean three times alone than to attempt to fly it again in strict formation.

It was noticed that the planes gained in speed with the hermetic sealing of the windows. The efficiency of new radio models developed by the Depart-

ment of Experimental Aeronautics was also tested in the flight. The equipment weighed seventy-three pounds. The planes were in constant touch with each other, with Italy and with naval vessels which could lend assistance to ships forced down.

It is the conclusion of the leader that the flight demonstrated the feasibility of a regular airline over the Atlantic and that other even more ambitious flights may be undertaken, based upon the experience gained in this flight. Preparations for a more extensive flight, possibly to the United States, are said to have been already formulated by the Italian Air Ministry.



General Guiseppe Valle and Col. Umberto Maddalena (right and left) who were pilots on the flight. (Center) Il Duce saluting the squadron before the take off

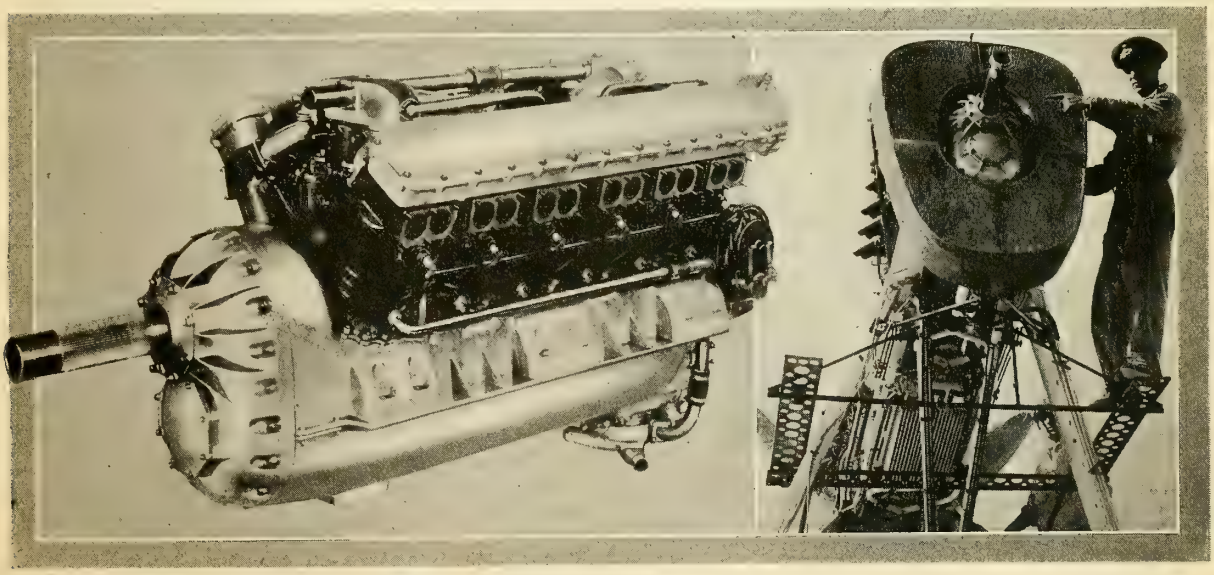
One of the most outstanding lessons of the flight is the value of careful preparation. Profiting from the experience of other similar flights, the first of which was made two years ago when sixty-four Italian planes went on a cruise of the Western Mediterranean, Balbo prepared for the flight over a period of about two years. A special school was founded at Orbetello for training the crews. For eighteen months they underwent intensive training. Before the squadron started the flight, a fleet of naval vessels was placed on duty along the line of flight to serve as refueling ships and to rescue any ships forced down.

The flight itself, aside from the tragic take-off at Bolama, was without striking incident. Starting from Orbetello, Italy on December 17 the planes flew in four groups in double triangle formation. Bad weather forced down three near the Balearic Isles and three others were forced down because of engine trouble but all reached Bolama in formation. The stops were at Cartagena, Kenitra, and Villa-Cisneros. Crossing the Atlantic, two planes were forced down because of leaking radiators. Both were promptly taken in tow by naval vessels. An unfortunate accident occurred just before one of the vessels reached Natal harbor with its plane. The ship was capsized and sunk almost in sight of its goal. The other was towed into harbor to be repaired and delivered, along with the rest of the planes, to the Brazilian government, which has arranged for their purchase. Balbo and his men will sail back to Italy. The final hop of the flight was to Rio de Janeiro where they were vociferously received by the public.

The flight was undertaken in accordance with the belief of the Air Minister that the efficiency of a nation's air force is demonstrated not by feats of its stars but by the rank and file. Not one member of the crew had ever participated in any extraordinary aeronautical venture.

Preparations for this and previous similar flights were carried on at the same time as the training of 3,000 pilots, construction of equipment, and establishment of airports, all with an appropriation of less than $40,000,000 annually.

Aside from its serving as a commentary on the ability of the leader who has built in less than eight years on limited funds an air force capable of such an undertaking, the flight was intended to stimulate trade between Italy and the South American countries.



The 500-horsepower Fiat engine and (right) its installation in one of the twin-motored trans-Atlantic Savoia-Marchettis

MAKE YOURSELF USEFUL

By Don Rose

MAYBE it's because the seventh son lately came to live with us, weighing seven pounds and seven ounces stripped for gym and born on the seventh day of January, but it's a fact that the problem of what should be done with a boy has been bearing down upon my gray hairs and stooped shoulders somewhat more than usual. It's a serious probem if you happen to have a boy and a more serious one if you happen to be a boy. If you should have seven boys all at one time, of ages from one month to fifteen years and five hundred freckles, you would know that it's something to worry about.

No doubt the well-known depression makes a growing boy seem somewhat more of a liability than he used to be. I admit I'm a little ahead of myself, but I begin to wonder what it would be like to have seven members of the unemployed feeding at my table. I can see now that it is going to be difficult to cut down papa's pants for all of them, since papa has only two pair of pants at a time and wears them down to what the engineers call a tolerance of about one-thousandth of an inch. And there are many other things a boy wants that are nearly as needful as pants.

You may suppose this is just an idle jest, such as might be expected of the unrepentant father of seven sons. But there's a real economic problem in back of it. Half a million or more new members join the army of the unemployed every year, whether the business barometer is going up or down, just because boys and girls grow up and decide to earn their own living. Anybody who is looking for work and hasn't found it is unemployed, and nearly every boy who is shaving in secret and wondering how he really looks in long trousers is for a little while, at least, a member of the unemployed. So don't laugh at me and my seven prospective apple-salesmen.

While worrying over this problem of finding work for seven boys who won't wash dishes, I came upon some fancy figures prepared by a pair of professors in the Middle West, which seem to have something to do with the case. These two gentlemen spent some years in taking apart about 13,000 boys to see what makes the wheels go round. They particularly wanted to find out something about a boy's ambitions at different ages and stages in his development. What does a boy want to do and what does he want to be when he grows up? And does it make any difference?

So they asked the boys and wrote down their answers. They found out, for instance, that the majority of eighteen-year-old boys want to be airplane pilots. At the other end of the scale they discovered that small boys of eight years of age would prefer to be cowboys but will take a pilot's license for second choice. Taking all the boys of all ages at once, the aeronautical ambition leads the list. When that was settled, they found out some other things. They found out, for instance, that the boys of today are not so keen on the soldier's life but would like to be big shots in the sporting word—football players, prize fighters, golf stars and tennis champions. That goes particularly for the little fellows; their older brothers would sooner be managers of successful heavy-weights or coaches of winning football teams. Which is the cynicism of youth or plain common sense, depending on how you look at it.

But the big idea is that most of the boys want to be pilots, which means that they will try to be pilots unless somebody stops them. If the professors know what they are talking about, there must be enough new pilots born every year to fly all the airplanes that were ever built and still have enough in reserve for a poker game in every hangar. It looks good for the flying schools, but not so good for parents who like to give their boys a break and who thinks it right and proper to encourage young ambition to go ahead.

But before I sign up the seven in the nearest flying school and put in an order for a private plane for each of them, I think I should be sure that this evidence means what it says. Does a boy really know what he wants? Let us consider, for instance, the case of the little chap who wants to be a cowboy and scalp Indians. I've got one of my own who thinks it's a swell idea and will practice on the baby if we don't watch him. What makes him think he wants to be a cowboy?

It isn't a particularly practical aspiration. There aren't enough Indians available, and even in the good old days a cowboy had other things to do beside running redskins off the range. Moreover, the best authorities say that the cowboy profession ain't what it used to be as an opportunity for profitable advancement. There's not much future in it.

Nor can it be said that the young idea of today is inspired to shooting and whooping and the branding of cattle by the example of his elders. The small boy's father, particularly in the suburban sections, is likely to look very little like a cowboy, nor will he behave like one in the watchful presence of the wife and family. It is quite possible that the small boy in the case has hardly seen a horse, and the only rope he knows will be the Monday washline. And yet he wants to be a cowboy, or so he says.

It seems to me that what he really means it that he wants to make a noise without being stopped in his tracks and to strut his stuff in something more to his taste than his Sunday suit. He wants to be a roughneck, because he is by nature a roughneck until he is at least ten years old. Doctors and dentists aren't roughnecks; neither are parsons or professors or paperhangers; neither is his own father, except at lodge meeting. The only roughnecks in the small boy's experience who are remotely respectable are the cowboys of the circus and the motion pictures. So a cowboy he will be, and it's no use arguing with him.

The same sort of psychology applies more or less to the bigger boys. They say they want to be airplane pilots. What do they really mean?

They mean, if I get them right, that they want to go where there is new work to be done, where life is exciting and where they can make a big chunk of machinery obey orders. They are not thinking of the particulars of the pilot's trade; they know nothing about them. They don't know the dullness of routine flying and they don't worry about the chances of the other kind. But they think that their restless ambitions will have a chance in the cockpit

(*Continued on page* 132)

EDITORIALS

NAVY HAS BEGUN TO THINK

IT looks as if the earnest, honest, patriotic work which public spirited and thoughtful citizens have been doing during recent years is beginning to show results; the United States Navy at last admits the major importance of aircraft in marine defense.

Admiral William V. Pratt, Chief of Naval Operations, in a recent address on "The Causes and Cure of War," said that he could see no hope for everlasting peace "until humanity has changed its nature." Only sentimentalists sufficiently unbalanced to believe that a majority of their fellowmen are or some time will be sentimentalists too, can doubt the accuracy of his conclusions. We don't know what the names of the last two brothers will be, but Cain and Abel were the first two and they had a private war which ended with Abel a casualty. Having studied history and watched our friends, not to say ourselves, we are sure three basic influences will continue—greed, jealousy and love, jealousy being associated as closely with greed as with love. Indeed, wars will continue; and the nations best equipped and trained will win them.

Admiral Pratt, as one of our war experts upon whom we must depend for national safety, has since he assumed command shown recognition of the fact that with aircraft development a new era in naval defense has begun.

In direct line with the Admiral's views is the strong trend toward what Washington already is predicting as "an airplane Navy."

Many details could be related in these columns but the essential fact is that the naval men at last, although against their will, have been convinced. And in this instance it will not be true that "those convinced against their will are of the same opinion still."

Assistant Secretary of the Navy for Aeronautics David S. Ingalls already has announced that coincidental with the new shipbuilding program the Five-Year Aircraft Procurement Program should add to the 1,000 provided for the Navy the number of additional new planes required for aircraft carrying vessels.

So hats off to Admiral Moffett. These things are part of the fruition of the long fight which he made as Chief of the Bureau of Aeronautics.

AN APOLOGY—WITH A BUT

AERO DIGEST wishes to apologize to the War Department for its last month's statement that 250 of the Five-Year-Program planes are outside the United States. Our error, gentlemen, and a grave one. Here are the facts: Only 161 planes are stationed in our various possessions. And are they needed there? Well, planes are needed there, but these planes—

Of forty-one in Panama, five are not in condition to fly; of eighty-one in Hawaii, fifteen are out of commission; of thirty-nine in the Philippine Islands, two are obsolete. So, really, only 139 planes are worth discussing and of these six in Panama are ancient bombers—the old LB-5 Keystone 2's with Liberty motors—leaving thirty. Hawaii has nine of the same type, leaving fifty-five; and the Philippines have four, leaving thirty-three.

Therefore our statement that we have only 250 planes was a gross exaggeration; we only have 120. We are greatly abashed for having been so grossly over-optimistic.

The "magnificient aircraft defense" of America's three most important strategic points is now precisely as we have detailed. General Lucius R. Holbrook recently declared that an enemy equipped with airplane carriers easily could invade New York City. If that is true of New York City, what about the balance of the country which has even less defense?

True, other planes have been authorized and we may get them in this generation—but only if we go after them. We need more planes, more airports and more fliers. Most things in this world are accomplished by people with enlightened self-interest. Gentlemen of the aircraft industry, go after this situation. Nobody will do it for you. In the first place, you need the business. In the second place—and do not let this slip your minds—you need aircraft defense just as much as anybody else does. An enemy bomb would wreck an aircraft factory as completely as it would a breakfast-food mill or the Capitol at Washington.

To an astonishing extent the safety of the nation depends upon the aircraft industry. Go down to Washington and teach this undeniable fact to Congress.

For this purpose what we need principally is organization. Let's get that, at least, and promptly.

BINGHAM

NEVER have we loved Hi Bingham of Connecticut. Now we love him less than ever. In our humble, ordinary-man fashion we consider him a liability and not an asset to the National Aeronautic Association and therefore to the art of flight and the industry which has been born of it. We think Hi is a handicap; we think that when Connecticut emitted him it labored (like the fabled mountain) and produced not a mouse—not even a Wickersham Commission.

The latest worry Hi has thoughtlessly inflicted has been to give Cleveland the National Air Races for five years. We say he did it, for the Executive Committee, as things are, seems to consist of Bingham, Bingham, Bingham, Bingham and Bingham—five members, you will note.

We don't blame Cleveland, we blame Big Hi and all the little Hi's that yes him.

It was an error to tie the races and the industry for five years more to the one city, splendid as that city is, and fine as was its treatment of us in 1929. The rest of the country is entitled to see what the industry is doing and the more of it that does see the better will the industry be doing.

It is magnificent that Cleveland should be so deeply interested in aviation. But outside of Cleveland (not counting Hoboken) are about 109,000,000 Americans. Why should the whole American air industry, just because the N.A.A. is suffering from Bingmonia, remain entranced with the delusion that Cleveland is the only city in America that can hold an air show?



Elgin instrument panel, with air speed meter in lower right-hand corner

THE PILOT AND HIS AIR SPEED METER

By Lieut. Logan C. Ramsay, U. S. N.

Author of "The Navigation of Aircraft"; Instructor in Aerial Navigation, Naval Air Station, Pensacola, Florida

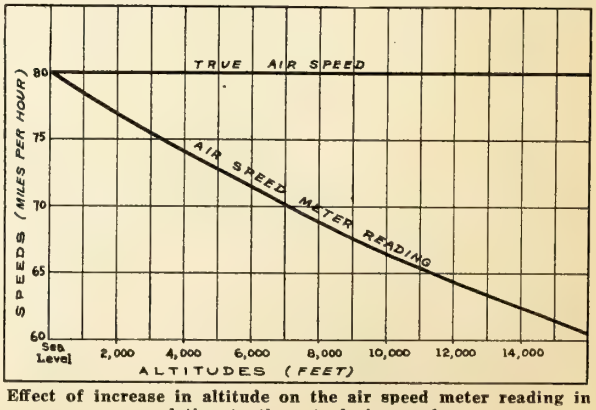
THE average pilot frequently fails to make the best use of one of his most valuable mechanical aids—the air speed meter. On ordinary flights he notes the reading of the instrument as he takes off and registers a mental resolve to maintain an air speed of at least five miles per hour greater than this reading until he is ready to level off for his landing. While he is in flight, a reading of 100 miles per hour means to him that he is traveling through the air at that rate and that any deviation from this velocity in his rate of progress over the ground is due to the hindering or helping effect of the wind.

The maintenance of the mental resolve is not only praiseworthy, but also conducive to longevity. The assumption as to the cruising speed is erroneous and may lead to serious trouble.

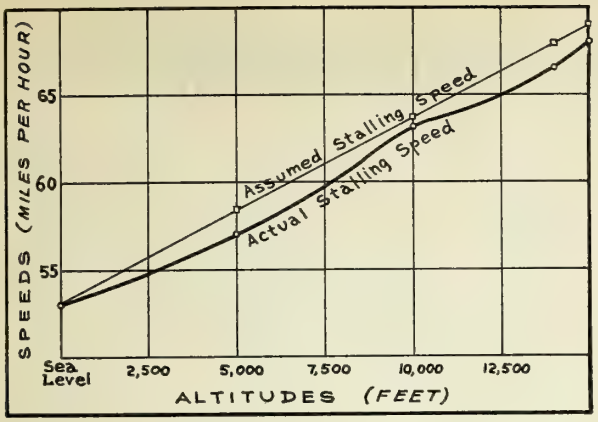
Basically, the air speed meter is a mechanical device for measuring the speed of a plane relative to the air through which the aircraft is moving. This measurement depends upon the pressure differential generated by suction and pressure on the exterior and interior of a metallic diaphragm. For accurate readings the instrument must be operated in an atmosphere of the same barometric pressure as that for which its indications were calibrated and, in addition, must be free from mechanical error. But instruments of flawless mechanical accuracy are goals aimed for but extremely difficult of practical attainment. The atmospheric pressure varies with the altitude and with changes in the weather. Hence, the readings of the air speed meter at any given instant during flight must be considered as relative, rather than absolute, indications of the true air speed. This fact, however, does not excuse the failure of a pilot to use any and all means available for determining the approximate correction to his *indicated* air speed in order to obtain a figure as close as possible to the *true*.

The first step in this determination is for the pilot to ascertain the mechanical errors of the instrument *as installed in his plane*. This procedure, called flight calibration, is comparatively simple. A level stretch of ground is selected and two markers, a known distance apart, picked as the extremities of the course. Then, on a calm day, the pilot flies over the course close to the ground at a definite speed by air speed meter and notes the time required to cover the distance between the two markers. From this time and distance the true velocity of the plane over the ground is computed. Then, in order to counteract the effect of any slight wind that may have been blowing, this performance is repeated; but this time the course is flown in the opposite direction. The two velocities are averaged, and this figure is considered to be not only the true ground speed, but the true air speed as well. (Caution:—the *speeds* must be averaged and not the *times*, for otherwise an error is introduced.) Since the mechanical errors of air speed meters usually vary with different readings of the gauge, it is customary to calibrate for all readings of the instrument, in steps of 10 miles per hour, between the stalling and maximum speeds of the plane. Then, by applying the errors so obtained, the pilot is able to ascertain for any reading of his instrument the corresponding indication of an air speed meter free from mechanical error.

This leaves uncorrected the effect of variations of atmospheric pressure from the normal for which the instrument was designed. These pressure differentials may arise from weather changes or from the decrease of pressure with increase of altitude above sea level. The errors arising from pressure changes consequent on the weather are usually



Effect of increase in altitude on the air speed meter reading in relation to the actual air speed.



Assumed stalling speed curve based on constant reading of 53 m. p. h. for all altitudes, and actual stalling speed curve based on flight tests.

much smaller than those arising from increase of altitude, and although they must be considered for test work, they may be disregarded by the pilot when engaged in rountine operations. A rough rule, but of sufficient accuracy for all ordinary purposes, is to consider that the air speed meter *under-reads* by an amount equal to two per cent of the *meter reading* for each 1,000 feet of altitude above sea level. For example, a mechanically perfect air speed meter reading 90 miles per hour while at an altitude of 5,000 feet above sea level would under-read ten per cent of the reading of the gauge or by nine miles per hour. Under these conditions the true air speed would be 99 miles per hour.

For illustrative purposes, let us assume that a pilot has a flight calibration of his air speed meter with the following results:

At 60 m.p.h. the instrument over-reads..... 2 m.p.h.
At 70 m.p.h. the instrument reads..... correctly
At 80 m.p.h. the instrument under-reads..... 1 m.p.h.
At 90 m.p.h. the instrument under-reads..... 3 m.p.h.
At 100 m.p.h. the instrument under-reads..... 2 m.p.h.
(Note:—When the above table mentions "at 60 m.p.h." an air speed meter *reading* is understood.)

If errors at any of the readings are found to be more than five miles per hour and no leaks can be detected, the instrument is probably defective and should be repaired by a competent instrument man or else replaced by a new instrument.

The pilot, with the air speed meter just described, is, let us assume, flying at an altitude of 4,500 feet above sea level. The reading of the meter is 85 miles per hour. What is his true air speed?

Indicated air speed per meter..... 85.0 m.p.h.
Instrumental correction (average, 80-90).. 2.0 m.p.h.
Reading of instrument free from mechanical error ..... 87.0 m.p.h.

Reading of perfect instrument..... 87.0 m.p.h.
Altitude factor of 9% @ 2% per 1,000 feet .09 m.p.h.

Under-reading of instrument due to altitude 7.83 m.p.h.

Reading of perfect instrument..... 87.0 m.p.h.
Correction for altitude..... +7.81 m.p.h.

True air speed..... 94.8 m.p.h.

For certain operations, notably aerial photo-mapping, the pilot may find it of advantage to fly at a definite air speed. In these cases, it is necessary for him to determine the reading of his air speed meter that corresponds to the desired true air speed. In this problem, the solution is the reverse of the one just given. The altitude correction is applied to the true air speed in the reverse manner, which affords the pilot the indication of the mechanically perfect instrument at the flying altitude. Then the instrumental error corresponding to this reading is applied in the reverse manner and the reading of the meter corresponding to the desired true air speed thus obtained.

For example, our pilot wants to find the air speed meter reading corresponding to a true air speed of 90 miles per hour while flying at an altitude of 7,000 feet. Now inasmuch as in this instance 90 miles per hour represents 114 per cent of the reading of the error-free air speed meter, we must divide 90 by 1.14 to obtain that reading. We cannot subtract 14 per cent of 90 miles per hour from the true air speed and get the correct result.

Ninety miles per hour divided by 1.14 equals 78.9 miles per hour.

Reading of error-free air speed meter at 7,000 feet..... 78.9 m.p.h.
Reverse of corresponding instrumental error 0.9 m.p.h.

Meter reading corresponding to true air speed 78.0 m.p.h.

The method just outlined is applicable in determining the instrumental errors when the field selected for the flight calibration lies at an altitude much above sea level. In the method of flight calibration previously described, it was assumed that the calibration course was at sea level. If, however, the scene of this operation lies above sea level, the effect of the altitude on the reading of the instrument must be eliminated before the instrumental error can be determined. For example, let us assume that the elevation of the calibration course is 2,000 feet. The reading of the air speed meter is 90 miles per hour and the average of the two measured speeds is 94 miles per hour. This latter figure, 94 miles per hour, is assumed to be the true air speed and the subsequent procedure is as follows:

Ninety-four miles per hour divided by 1.04 (altitude effect is four per cent) equals 90.4 miles per hour.
Reading of perfect air speed meter..... 90.4 m.p.h.
Reading of air speed meter..... 90.0 m.p.h.

The instrument under-reads..... 0.4 m.p.h.

From the standpoint of airmanship the effect of altitude upon the reading of the air speed meter is a happy one. The reason for this lies in the fact that the stalling

(*Continued on page* 146)



The pilot can determine the relation of his indicated to his true air speed by the expedient of flight calibration.

AIR—HOT AND OTHERWISE

The N. A. C. A. Counters

Frank A. Tichenor

IN these columns in December, I reviewed the conditions prevailing in the National Advisory Committee for Aeronautics which prevent it from functioning in a manner useful to the best interests of the industry it purports to serve. The discussion has disclosed evidence of widespread interest in this question. It becomes ever more apparent that the points touched on have for some time been a subject of concern to many. The importance of a wise and honest expenditure of public funds appropriated specifically for scientific research and not for a cheap substitute for it, is generally recognized. The conditions which urged us to stress this vital phase of aeronautical development have found sympathetic response among all who have at heart the good of aviation and the country.

The comments of those who concur in our contentions contain little that has not already been said in these columns. As a matter of fact, little more can be said concerning these conditions which have lasted so long and about which informed public opinion fairly agrees. It was with interest and curiosity, however, that we awaited replies of defenders of the present N.A.C.A. management. We had hoped that some bright spots might be brought to shine on the otherwise dark picture, that perhaps things are not quite as bad as they appeared to us. Unfortunately we were disappointed in this hope. Although the management of the N.A.C.A. has an advocate who apparently tries to defend its policy, actually he only concurs in the broad picture which we painted. Indeed, we fear the picture is even darker after his defense than it would have been without it. We are disposed to believe now that conditions are even worse than we at first suspected, and that the trouble is not only lack of ability, but also absence of an honest attempt to accomplish the laudable task which the N.A.C.A., through its presiding body, has assigned itself.

This seems to be another case in which a feeble attempt to defend a weak cause serves only to render its defects more vulnerable. It almost looks as though the defender of the N.A.C.A. management in his own heart agrees with us; and although he finds it expedient to depreciate our criticism, he writes as though he himself would like to see reform effected. He does not call attention to one successful research, nor one scientific advancement which can be credited to the N.A.C.A., nor even one technical advance which we may have overlooked. Nor does he suggest that such advances can be expected in the near future. Indeed, there is not even the assurance that they will eventually be forthcoming or that anything is being done to hasten that day. Our principal criticism, the absence of scientific research, is tacitly admitted. Such research, he contends, is the proper sphere of universities, not of the N.A.C.A.

Now, we have not, merely as the result of our own judgment, specified scientific research as the task of the N.A.C.A.; we quoted this as the N.A.C.A.'s task from the Committee's own annual reports. The defender of the N.A.C.A. cannot logically ignore this point altogether, as he does, for it is the most important consideration, the keynote of the N.A.C.A.'s shortcomings. This is not a question of opinion only; rather, it is far more a question of keeping faith, of loyalty to duties defined by the supervising body of the N.A.C.A. The policy of conducting scientific research was adopted ten years ago by the presiding Nominee Committee, made up of the foremost experts of the country. In all annual reports since then, it has been recorded as the accepted policy of this body. It has been pleaded for in hearings before Congressional committees. It has formed the basis for public appropriations. Does the defender of the N.A.C.A. mean to imply that there is one policy for obtaining appropriations and for general advertising and publicity purposes and quite another one for the actual service and activity within the walls of the N.A.C.A.?

We are referring chiefly to a reply to our article expounded under the sponsorship (and probably under the personal authorship) of one who is himself a member of the supervising body of the N.A.C.A. Having been appointed by the President to serve as a member of the group prescribing the policy of the N.A.C.A., he certainly cannot plead ignorance of that policy. His words would indicate that he is opposed to the policy of scientific research, that he prefers something easier and cheaper. If that is so, he can well argue that everyone has a right to an opinion of his own. It is, however, one thing to advocate a change of policy and quite another to advocate disobedience to a policy established by authority, laid before Congress and the nation, for the execution of which policy appropriations have been made. No ordinary citizen should advocate disobedience to rules established by authority; he ought rather to satisfy himself by urging and pleading for reforms. How much more shocking is it that a member of the Committee should defend the management's activities when they are in direct contrast to the policies promulgated by the presiding body! Our opponent's failure to acknowledge the authorized policy of the Committee has greatly intensified our conviction that something *is* wrong with the N.A.C.A.

We expected the defender of the N.A.C.A. to give us evidence (or at least to try to give us evidence) that we had erred, and that the N.A.C.A. after all is true to its avowed ideals. Instead he denounces these ideals, admitting thereby the justification of our criticism. He joins us so far as the facts are concerned; he concedes the point that the N.A.C.A. has made no "contribution to pure science" and merely tries to make that failure appear insignificant.

This thing is not insignificant, however. If money is appropriated for scientific research, can we consider it of no consequence that those funds are spent for something else? The presiding body of the N.A.C.A., Congress, the industry—all of us expect the N.A.C.A. to be a bright torch of science; we have a right to expect that. We know that a great national organization is needed as a guiding light for a prosperous aviation industry, not as a satellite which merely reflects faintly the illumination of more brilliant bodies. This point is not one for which compromise can suffice. Either there is scientific research or there is not, and (*Continued on page* 122)

THE TREND OF THE TIMES

By

David Lawrence

WITH news events in the business world passing in daily review, some of them favorable and some unfavorable, it has been difficult to maintain a perspective. And yet looking back over the last few months and looking forward to the fateful months of 1931, we are bound to admit we see more clearly with each passing day the great tasks of reorganization now in process.

Stabilization is like a panorama. Its compelling force has gripped industry after industry, and although we may not perceive it immediately in our day by day outlook, we know full well that commodity prices are slowly but gradually being stabilized and that money rates, at least, have found a natural level.

But what shall we say of public confidence? Has that been stabilized? The closing weeks of 1930 revealed a surprising lack of faith on the part of many people. It was mostly because they saw here and there a mortality in banks which they did not understand. There was really nothing surprising about the number of bank failures—the real surprise was that some of those banks which failed had held on so long. In February, a year ago, the Comptroller of the Treasury, John W. Pole, told a Congressional committee in open session that at the rate at which banks were failing at that time of the year, 1930 would see the largest number of bank failures in recent history.

So there was no secret about the number of bank failures expected for 1930. The usual rate of bank failures is about six hundred. 1930 had in the neighborhood of one thousand! Nor was it particularly unexpected to find occasionally a fairly large institution caught in the maelstrom of frozen credits or imprudent investments. Individual bank officers themselves, here and there, participated in the bull movement of 1928 and 1929, and it was only natural that some of the enthusiasm which carried them away in individual speculation should have affected their judgment as bankers.

But is it all attributable to imprudence? How many of the self-same loans which gave the banks so much trouble were the direct consequence of a period of inflation in which all values went skyhigh? Certainly in examining some recent bank failures, we find that real estate played no inconspicuous part. One might say it is a faulty economic structure which permits of such wide fluctuations in the value of real estate. After all, the real estate market is affected by the money available for investment in buildings, and when there is an abundance of cheap credit real estate will get its share.

Lessons were taught in 1930, nevertheless, which will not soon be forgotten—at least not by the present generation. Appraisals which seemed good in 1928 and 1929 faded away in the brass-tacks appraisals of 1930.

To those who wonder at the length of the present depression, one must refer back to economic cycles of other periods of American history. I was talking with Secretary Mellon recently about the depression which began in 1873. It was just as fresh in his mind as if it had happened yesterday. He said it was much worse than anything we are experiencing today. Out of an abundance of experience with depressions, he says real estate is usually the last thing affected.

We may infer, therefore, that the storm which at first shattered the buildings of light construction has now swept with hurricane strength some of the stronger buildings. We may infer, also, that we are coming through the storm now and that the next few months will see the end of the most severe winds of trade.

What are the things that lift a country out of its depression and start it forward on the road to real recovery? Turning back the leaves of history, we find that new industries frequently arise to take the place of those that have lagged behind. We talk of "construction" as perhaps furnishing a stimulus to the whole business situation. It is a broad term covering many kinds of building, covering repairs, replacements and even the rebuilding of cities.

Some large plans have been suggested. It may be, for instance, that the rebuilding of the slums in many cities will completely restore the value of central sections accessible to business and convenient from a traffic viewpoint. Some of the best parts of New York City are on the East Side. In recent years, private capital has gradually restored some of those areas. It may be that funds will be available through the coöperation of governmental and private investors to rebuild whole blocks of the East Side in New York. Other cities may follow the same example.

If building costs are low and money can be borrowed on a long-time basis, guaranteed by governmental units, and building is done where private capital would not think of venturing, a stimulus can be given to real estate. These are some of the thoughts being advanced nowadays in the hope of rearranging the whole economic structure.

Meanwhile, the Federal Reserve System with its low rediscount rate, the slow but sure stabilization of many commodities at price levels that are attracting buyers, and lastly, the strengthening of public confidence, cannot but give the beginning of 1931 a much more cheerful prospect than the nervous moments experienced by the financial world in December, 1930.

The final thing to remember is that it took nearly a year to wash out some of the troublesome situations which had been overhanging the business world, and that pessimism is a sequel to untoward developments rather than the precursor of unfavorable occurrences.

If one has the perspective of a long depression begun in the summer of 1929 and continuing perhaps for another couple of years, true encouragement can be derived from the gradual upturn of business during the new year. For even the pain of a three-year depression can be borne if we can know definitely that each month is an improvement upon the preceding month, however minute the improvement be. It is uncertainty which is bewildering and perplexing, whereas certainty begets careful planning and intensive reorganization for the painful but necessary process of readjustment.

10 MONTHS' AIRCRAFT EXPORTS, 1930

By Courts D. Rea

Aeronautics Trade Division
Department of Commerce

UNITED STATES exports of aircraft products during the first 10 months of 1930 were only 6.1 per cent less than during the same period of 1929, whereas the total exports of all other commodities underwent a larger reduction as a result of the business depression.

Exports of complete aircraft, aircraft engines and parts (not including tires) during the 1930 period were valued at $7,288,014, as compared with $7,761,977 in the 1929 period. The high level maintained by aircraft exports, as compared with those of all other commodities, may be accounted for largely by the fact that the bulk of American airplanes are purchased by foreign governments rather than by individuals, and a government's purchasing power is affected less quickly than the private individual's when depressed business conditions prevail, as during 1930, throughout the world.

Had it not been for the fact that foreign sales of complete aircraft to Latin-American countries were lower during the 1930 period than during that of 1929, total exports would have shown an appreciable increase, since aircraft engine sales were greater in value by more than 21 per cent, and an advance of more than 10 per cent was registered in sale of aircraft parts.

In the case of Mexico, for instance, our exports of airplanes during the 1929 period were considerably above average, sales to that country amounting to more than $1,500,000; but this value was materially reduced in the 1930 period, probably because of the fact that 1929 procurement programs were sufficient to take care of orders that would otherwise have been placed throughout the 1930 period by the government and the airline operators. Sales of planes to private owners were not strong enough to overcome this fluctuation. Another factor in point was the recent completion, in Chile, of an aircraft factory under American supervision, where airplanes of military types are being manufactured for that government. Under normal conditions this plant can supply most of the planes used by the Chilean military services, whereas in the past they have been imported from the United States. Although the present output of this factory would not in itself have affected our exports, the contemplated future production schedule has undoubtedly been instrumental in reducing the number of sales that would have been made there.

Exports of our aircraft engines to Latin-American countries during the 1930 period were 34 per cent greater in value than for the corresponding 1929 period, numbering 138 valued at $560,523 as against 108 engines costing $417,126 for the 1929 period.

The sale of aircraft parts and accessories to this area in the 1930 period rose in value to $875,965 from $399,905 in the 1929 period—a year's advance of 119 per cent.

Countries of the Far East, on the other hand, have expanded their trade in American aeronautical products substantially. Through the 1930 ten-month period, 61 airplanes valued at $1,384,723 were purchased by Far East countries, or 123 per cent more than in the same period of 1929 when forty-four planes were purchased at a value of $620,233.

Aircraft engines exported to the Far East during the 1929 period numbered 42 at a cost of $163,046. Within the 1930 period 37 were exported, but the value increased to $207,522 or by 27 per cent.

Exports of spare parts to the Far East increased from $188,726 in the 1929 period to $218,085 in the 1930 period, or by nearly 16 per cent.

Several notable changes in the 1930

(*Continued on page* 122)

UNITED STATES EXPORTS OF PARTS

	First Ten Mons., 1929 Value	First Ten Mons., 1930 Value
Canada	$762,123	$438,529
Soviet Russia	159,668	263,118
Chile	37,302	259,306
Argentina	39,225	174,372
Peru	110,750	113,834
Brazil	10,912	103,940
China	90,034	102,400
Mexico	95,941	69,912
Japan	55,545	58,037
Panama	31,535	44,761
Netherlands	26,035	35,687
Cuba	38,956	30,825
Germany	75,689	29,910
Java & Madura	—	23,695
Surinam	655	21,286
Australia	13,462	19,515
Trinidad	233	18,618
United Kingdom	58,126	14,727
Colombia	20,422	13,724
Belgium	15,135	11,603
Philippine Isl.	19,928	9,902
Yugoslavia	—	9,731
France	19,904	9,070
Italy	19,108	8,633
Poland and Danzig	23,440	6,887
French Africa	—	6,037
Switzerland	15	4,506
Salvador	1,913	4,243
Bolivia	—	4,222
Union of S. Africa	—	3,831
Siam	2,034	3,321
Sweden	1,350	3,126
Spain	—	2,787
Haiti	—	2,678
Venezuela	—	2,408
Uruguay	43	2,042
Nicaragua	2,865	1,804
Czechoslovakia	1,096	1,588
Virgin Islands	1,003	1,536
Gautemala	—	1,355
Costa Rica	—	1,175
Dominican Republic	95	1,101
British Honduras	—	1,057
Honduras	1,331	894
British West Indies	1,119	872
Hong Kong	5,500	619
British India	—	499
Syria	—	430
Newfoundland & Labrador	—	294
Denmark	2,742	175
British East Africa	—	98
New Zealand	1,363	85
Portuguese Africa	—	25
Hungary	—	25
Austria	—	22
British Malaya	—	19
Norway	1,500	—
French Oceania	860	—
Bermuda	4,575	—
Finland	4,050	—
Other Countries	6,932	—
Lithuania	—	25
Ecuador	1,030	—
Totals	$1,765,544	$1,944,914

UNITED STATES EXPORTS OF AIRCRAFT ENGINES

	First Ten Mons., 1929		First Ten Mons., 1930	
	No.	Value	No.	Value
Germany	48	$315,576	30	$212,747
Peru	7	43,242	34	180,007
Soviet Russia	2	19,643	28	128,372
Netherlands	5	11,500	27	121,683
Panama	30	159,096	29	120,433
Mexico	38	197,355	22	77,883
Canada	24	92,086	50	69,819
Chile	6	30,577	12	65,410
China	9	39,000	11	65,090
Honduras	2	4,949	15	59,255
Japan	24	75,098	12	58,519
Java & Madura	—	—	8	57,361
Brazil	2	2,898	4	27,122
Argentina	12	32,132	5	26,030
Italy	3	5,680	6	23,292
Trinidad & Tobago	1	766	3	22,444
Australia	2	1,529	4	22,352
Belgium	1	12,000	5	20,275
Rumania	—	—	6	19,083
Sweden	3	1,810	1	15,865
Cuba	1	4,827	5	15,567
West Indies	—	—	2	9,000
Guatemala	3	2,350	4	7,758
Bolivia	—	—	1	7,650
Finland	—	—	1	7,496
Spain	—	—	2	7,254
Colombia	3	20,021	1	7,200
Union of S. Africa	—	—	1	6,890
United Kingdom	3	12,100	1	4,462
France	9	50,061	1	4,025
Philippine Isl.	4	39,003	1	200
Poland & Danzig	35	121,015	—	—
Switzerland	1	19,375	—	—
Nicaragua	1	4,000	—	—
Dutch Guiana	1	4,000	—	—
Salvador	1	913	—	—
Norway	1	200	—	—
French Oceania	1	150	—	—
New Zealand	2	8,266	—	—
Venezuela	—	—	1	7,232
Hong Kong	—	—	1	4,000
Totals	285	$1,221,198	334	$1,481,308

UNITED STATES EXPORTS OF AIRPLANES

	First Ten Mons., 1929		First Ten Mons., 1930	
	No.	Value	No.	Value
China	9	$142,971	37	$901,272
Peru	6	106,852	43	756,654
Canada	71	713,889	57	666,778
Mexico	80	1,504,001	37	314,113
Japan	17	291,767	14	301,687
Chile	40	721,750	14	289,156
Argentina	18	340,888	20	233,871
Java & Madura	—	—	7	140,000
Panama	7	112,353	9	65,305
Cuba	2	21,800	5	36,858
Colombia	1	60,000	2	33,350
Brazil	4	145,200	2	33,000
Hong Kong	11	104,600	2	21,764
United Kingdom	2	68,600	3	21,500
Dutch East Indies	—	—	1	20,000
Italy	4	86,569	1	10,800
Union of S. Africa	—	—	2	6,097
Denmark	—	—	1	4,515
Gautemala	4	10,000	2	4,032
Iceland	—	—	1	1,040
Ecuador	5	187,237	—	—
Philippine Is.	4	68,114	—	—
Honduras	2	19,645	—	—
Norway	2	8,053	—	—
French Oceania	1	7,000	—	—
Australia	11	3,800	—	—
New Zealand	1	2,181	—	—
Uruguay	1	1,800	—	—
Netherland	3	16,000	—	—
Salvador	3	27,840	—	—
Dominican Rep.	1	2,525	—	—
Totals	300	$4,775,235	260	$3,861,792

New Devices for Reducing Fuel Consumption

SCHWARZ AIR INJECTION

BRAKE tests and other practical demonstrations of a new air injection system for engines invented by Mr. Alfred Schwarz were recently made before a group of engineers and a representative for AERO DIGEST. With a two-cylinder 12-horsepower Palmer marine engine, it was demonstrated that with air injection the power was almost doubled. Other fuel consumption and power output comparisons were made using a Ford automobile motor on a standard Diel electric dynomometer. It is Mr. Schwarz's intention to apply the air injection system to a new design of airplane engine which he believes will deliver greater power for weight than hitherto believed possible with a conventional type of engine.

The basic principle of this engine resides in the manner in which air is supplied to the burning charge in the combustion chamber of the engine after the intake valve is closed in order to support the burning of the charge. This is radically different from internal combustion engines of present-day design, in which a fuel-air ratio once established cannot be altered during the burning of the charge, thereby resulting in a decrease of oxygen and an increase of carbon dioxide, which reduces the burning speed to such an extent that but a small percentage of the fuel value is converted into power.

An engine of the same bore and stroke as present-day engines but utilizing the Schwarz air injection system will show, at wide open throttle, 80 per cent increase in horsepower and, at different lower throttle settings, as high as 500 per cent increase in horsepower. Although this development, of course, is of greatest value to the automobile industry, its importance also applies to aeronautics for the reason that the weight of engines can be cut in half, or, inversely, the horsepower for given weight can be doubled. In addition, the weight of fuel carried can be reduced to about one-half, and less dangerous fuel can be carried in the form of kerosene or fuel oil.

Present-day engines convert but one-quarter of the fuel into power, when operating under full load, but when operating under partial load, only a few per cent of the available heat units fed to the engine are converted into power.

The internal combustion engine is unique in that fire takes place without a continuous supply of air, whereas in every other instance in which fire is used, air is supplied continually. The engine designer must choose between (1) a charge that explodes too rapidly, causing pre-ignition, and detonation, or (2) a slow burning charge that will not produce maximum power. In every piston position the composition of the charge changes: in the beginning it burns very rapidly, then slows up because of lack of oxygen, creating an increase of carbon dioxide, which, as is well known, is used to extinguish fires not augment them. This defect is overcome by the new Schwarz engine which supplies air to the burning charge, thereby putting the flame propagation under control.

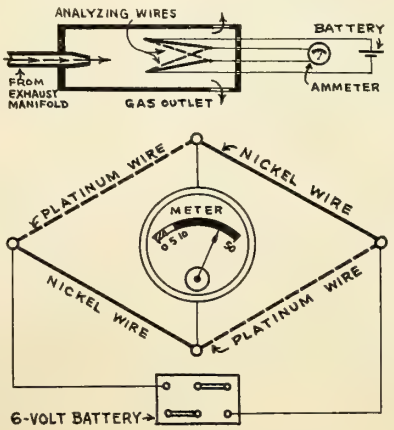
The fuel burning reaction taking place in any present-day engine is chemical in character, and the fuel (usually an oil or gas) is a hydrocarbon composed of hydrogen and carbon; one of the best known hydrocarbons is gasoline. Hydrogen unites with oxygen and burns to water, and carbon unites with oxygen and burns to carbon dioxide. As combustion progresses, carbon dioxide and water vapor take the place of the oxygen and a condition is created which is chemically incorrect to support further burning. This condition is, of course, created gradually. The burning becomes slower and slower until the fire is out.

The Schwarz principle must not be confused with supercharging or carburetion, for it constitutes a new engine cycle where air injection is inserted as a new motion in the cycle. In the Schwarz engine the fuel is regularly carbureted and corrected for proper burning during the explosion.

HUTCHISON MOTO-VITA

MOTO-VITA, a device designed primarily for installation on airplanes to increase payloads by giving greater mileage to a given amount of gasoline, and to eliminate the generation of carbon monoxide gases from the engine exhaust, has been developed by Dr. M. R. Hutchison.

The invention makes use of the phenomena of chemistry known as catalysis, giving a quantitative analysis of the exhaust fuel gases from the engine to which it is attached. The process involves the conversion of the catalysis into electrical energy, registering on a dial scaled to percentages of the gases measured.



Diagrams of the Hutchison Moto-Vita

When installed for use on an airplane, the device continuously analyzes the exhaust gases from the powerplant. The mechanism includes a small indicator fixed on the instrument panel, which indicates the extent to which the fuel is being wasted. While the plane is in the air, the pilot may adjust the fuel-air ratio to provide the desired combustion. The device weighs approximately one and one-half pounds.

Carburetors on aircraft engines must be adjusted according to variations in the altitude or changes in weather conditions. If a carburetor is adjusted too lean, the engine will overheat; and if too rich, fuel is wasted, cylinders are carbonized, spark plugs fouled, lubricating oil is diluted by excess gasoline and carbon monoxide gases are generated. By providing a means of attaining efficient fuel-air ratio, Moto-Vita eliminates the guesswork in carburetion, according to Dr. Hutchison.

John C. Hutchison, Dr. Hutchison's son, conducted over a period of six months experiments with a Fairchild monoplane equipped with Moto-Vita. The results of these experiments showed that less than two-thirds of the amount of fuel ordinarily required to travel a given distance was consumed. An airplane equipped with this mechanism may safely carry one-third less of the amount of fuel required at present, and this weight (six pounds per gallon) may be replaced with payload. For each thirty gallons of gasoline which are saved, an additional 170-pound person and baggage may be transported. The use of this device has increased the cruising radius of a plane to as high as one and three-fourths times that heretofore attainable with the same amount of fuel and payload.

A flight on which the performance of this device was tested with successful results was made on December 3, 1930, by Capt. Frank M. Hawks. Flying the Travel Air Myster S *Texaco* 13, Captain Hawks traveled from New York to Memphis, Tenn., a distance of 950 miles. The Moto-Vita with which his plane was equipped reduced fuel consumption approximately forty per cent.

Dr. Hutchison recently demonstrated this device to representatives of AERO DIGEST.

BLUEPRINT DRYER

THE new Pease "Junior" sheet dryer, manufactured by the C. F. Pease Company, Chicago, Ill., is a dryer for blueprints, negatives, blue line and brown line prints up to 24 inches wide. Also when a chromium plated cylinder is used, it is adapted for drying photo prints.

Prints are fed into the dryer over a brass scraper rod and up an inclined feed table which drains the water away from the drying drum and prevents steam pockets and creased prints.

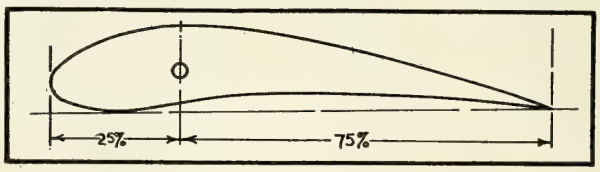
THE CENTER OF PRESSURE

Article Eight on the Principles of Aerodynamics

By
Dr. Max M. Munk

IN the preceding article of this series we learned that the theoretical lift of a wing at any particular angle of attack is proportional to that angle, measured from a suitable standard. The lift coefficient is equal to $2\pi\alpha_{ae}$, hence the lift is equal to this, multiplied by the wing area and by the dynamic pressure of the motion. The designer, however, must know not only how much lift there is, but also where it acts. That is the problem which we are to consider in the present article.

The procedure is similar to that employed in last month's article. First, from the entire air force we separate the lift produced by a constant local angle of attack as distinct from lift produced by a variable local angle of attack. As for the former, we recall, the guiding powers of the different portions of the wing section are independent of its shape—which leads directly to the conclusion that the lift caused by a change of the angle of attack must possess one universal position, since its elements are always distributed equally along the chord. The lift produced by a change of the angle of attack must pass through one universal point of the chord, which we shall call the "aerodynamic center" of the wing section. This aerodynamic center must not be confused with the center of pressure of the wing force. The latter refers to the entire lift, not merely to the portion of the lift produced by a change of the angle of attack and superposed on the lift existing before the change took place. Neither must it be confounded with the center of the wing section, which is at 50 per cent of the chord. The center of the wing section and the aerodynamic center are fixed, but the center of pressure generally is not; it travels fore-and-aft as the wing encounters varying flight conditions.



Aerodynamic center at 25 per cent of the chord.

The determination of the position of the universal aerodynamic center is purely a mathematical problem. Since the rear portions of the wing section are much stronger in guiding power than the front portions, it would seem logical to assume that the aerodynamic center is forward. The aerodynamic center (the center of action of the lift forces in question) must be computed not from a summation of the guiding powers as such, but from a summation of the results of such guiding powers.

As a matter of fact the strongest guiding power remains passive and inactive if the air to be guided arrives already flowing in the direction of the guiding element. The front elements of the section, in spite of their lower guiding power, actually are the more active in deflecting air because the air approaches flowing in its original direction and receives its initial deflection by the leading portions of the wing. When the air reaches the rear of the wing section, it has already nearly acquired its final direction of motion, which condition leaves little for the rear elements to do, in spite of their stronger potential guiding power. Therefore the weak elements deflect more than the strong elements because they have more to deflect.

Consistent with this reasoning, mathematical analysis locates the universal aerodynamic center at a distance from the leading edge equal to one-quarter of the wing chord. Theoretically, the lift produced by a uniform distribution of the local angles of attack through a change of the angle of attack of the entire section, is effective at 25 per cent of the wing chord. With respect to that point, the superposed lift does not exercise any moment. The moment coefficient of any wing section relative to the 25 per cent point is, therefore, independent of the angle of attack; it has the same value over the whole range of the angle of attack for which theory holds.

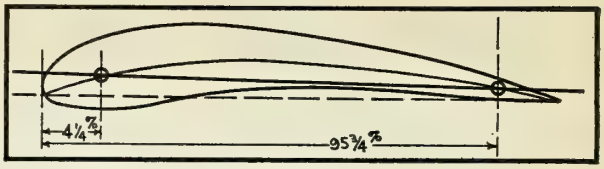
This constant moment, unless it is zero, removes the center of pressure of the entire resultant air force away from the 25 per cent point. The relative influence of the constant moment on the position of the variable lift becomes smaller as the lift becomes larger. The center of pressure travels accordingly, approaching the aerodynamic center as the lift increases. With most conventional wing sections, however, it never reaches the 25 per cent point, because the angle of attack at which it would do so is beyond the point where theory holds. The friction forces then dominate and prevent the formation of potential flow. The center of pressure comes near the 25 per cent point only if the constant moment is exceedingly small.

From these arguments there follows a result quite important to the designer. It is possible to design wing sections with no center of pressure travel and with a fixed location of the lift—when the moment around the 25 per cent point is zero. The fixed center of pressure is, in such a case, at 25 per cent, coinciding with the aerodynamic center. These facts yield the universal rule that a constant center of pressure, if any exists, is always located at 25 per cent of the chord. There can exist no wing section with a constant center of pressure located substantially in rear of the 25 per cent point. This fact is deplorable; it renders the absence of center of pressure travel of small value, because such travel is never really absent. At large angles of attack, where the friction forces become dominant, the center of pressure moves into the vicinity of the wing center, near 50 per cent, whether or not the theoretical travel of the center computed from its potential flow be zero. Under any circumstances, therefore, the wing must be designed to withstand the stresses of a load near the center; the absence of travel within the ordinary flying ranges does not, in other words, simplify the structural requirements. But for the present let us continue our discussion of the theory and return later to the practical questions concerning the application of it.

Computation of the center of pressure requires knowledge of the constant moment coefficient with respect to the aerodynamic center, in addition to knowledge of the location of the latter. Thus far we have ascertained only the location of the aerodynamic center. By a simple method we can determine the missing quantity. Rather than give a rule for the direct computation of this constant moment coefficient, we choose a slightly different method of determination. It is more convenient to determine the angle of attack of the wing section at which the center of pressure is located at the center, at 50 per cent. Once we have determined that angle, ordinary shop mechanics is sufficient to compute the center of pressure location at any angle of attack. With a wing section symmetrical fore-and-aft—that is, a wing section with equal front and rear halves—the answer is particularly easy. If such a section moves parallel to its chord, the entire problem is symmetrical and hence the created air motion is symmetrical too. There is equal air flow fore-and-aft and there is an equal pressure distribution fore-and-aft. Hence the resultant air force must conform to the symmetry too. It is evident, therefore, that the center of pressure of such a symmetrical section moving symmetrically is at the center —at 50 per cent. Its symmetrical direction of motion—that is, a motion giving rise to a symmetrical flow and to a symmetrical location of the air—is parallel to the chord.

With unsymmetrical sections, the direction of 50 per cent center of pressure location (which we will call symmetrical position) can be estimated by choosing that direction with respect to which the absence of symmetry is least pronounced. From previous discussion we know that the thickness of the section has no influence on the creation of the lift, nor on its distribution. It is the symmetry of the mean camber line which we must consider. With a symmetrical camber line, such as a circular arc, the chord of the camber line represents the symmetrical direction. With any other camber line the symmetrical direction must be computed from the shape. Mathematical analysis shows that the symmetrical direction can be estimated exactly enough for all practical applications, by connecting by means of a straight line the points of the mean camber line at 4¼ per cent and at 95¾ per cent of the chord. That is then the symmetrical direction.

We now have all the necessary data. The constant moment coefficient is computed at the symmetrical position. It is equal to the lift at the symmetrical angle of attack multiplied by the lever arm which is equal to one-quarter of the chord, the distance from the center of the section to aerodynamic center. The constant moment is zero, and accordingly the center of pressure is fixed if the lift at the symmetrical position is zero—that is, if the symmetrical direction and the average direction of the wing section coincide. The center of pressure is then at 25 per cent. In all other cases the center travels, and the larger the lift in the symmetrical position the greater the travel. The extent of the travel is therefore indicated by the magnitude of the angle α_c between the average direction and the symmetrical direction. It follows further that the center of pressure travel of all wing sections is in general always the same and that it is exactly the same for all angles of sections with equal characteristic angle α_c. Theoretically, all sections with the same characteristic angle have exactly the same lift and the same position of the lift at all equal absolute angles of attack. Actually, this holds only for the limited range of the angles in which the friction does not become dominant. Within that range, however, theory is confirmed by observation.



Construction of symmetrical direction.

The center of pressure can now easily be expressed by a formula containing the absolute angle of attack and the characteristic angle of attack. The lift, for convenience, is assumed to be directed at right angle to the chord. Its magnitude is

$$L = 2\pi\alpha_{ae} SV^2\varrho/2$$

If the angle of attack is equal to the characteristic angle, the lift is then

$$L = 2\pi\alpha_c SV^2\varrho/2$$

and this lift acts at 50 per cent. Hence the constant moment is equal to this force multiplied by $c/4$, where c denotes the chord length.

$$M = \tfrac{1}{2}\pi\alpha_c ScV^2\varrho/2$$

At any other angle of attack the position of the center of pressure is computed by dividing this moment by the lift:

$$CP = \tfrac{1}{4}\varrho(\alpha_c/\alpha_{ae})$$

or, in per cent of the chord:

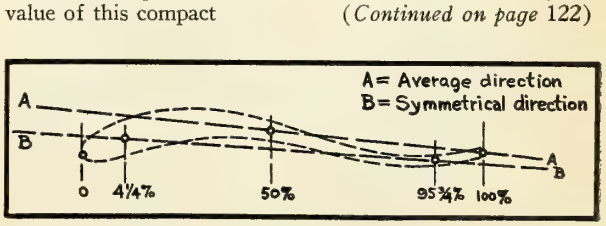
$$CP = 25\ (\alpha_c/\alpha_{ae})\%$$

This is the distance of the center of pressure from the 25 per cent point. Expressed in the usual way, as distance from the leading edge, the center of pressure results as

$$CP = 25\%\ (1 + \alpha_c/\alpha_{ae})$$

It is remarkable how broad, fundamental and simple the results of our wing section theory are. There remains nothing involved, nothing requiring anything more complicated than high school mathematics. The results contain four numerical items only, two for the lift and two for the center of pressure. For both cases there is one rule for the determination of a direction, consisting of connecting two specified points by a straight line. In both cases there is, further, a numerical item, 2π, for the lift coefficient and one-quarter for the aerodynamic center. All further computations and applications are entirely elementary.

It should be understood, of course, that even from a mathematical standpoint the results obtained are only approximate. They contain the assumptions of small angles of attack and of relatively thin wing sections with little camber. In this respect, the aerodynamic wing section theory is comparable to the elastic theory of beams, where similar assumptions as to the geometric dimensions of the beam are made. In either case, the simplifying mathematical assumptions are more beneficial than harmful; the value of this compact (*Continued on page* 122)



Characteristic angle of wing section between the line connecting the 4¼ and 95¾ per cent points and that connecting the 50 and 100 per cent points.

WELCOME THE MOSQUITO FLEET

By Dwight Huntington

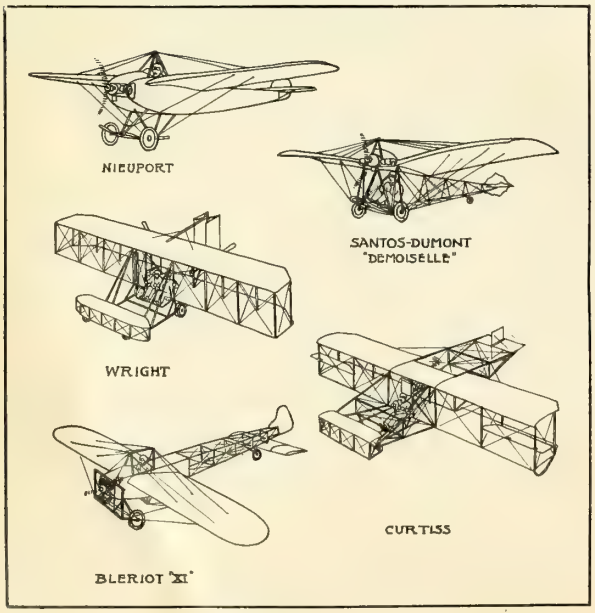
AMONG other things, airplane designers are faddists. One year they go in quite generally for open-cockpit biplanes; the next year for closed monoplanes. One day high performance sport jobs are the rage; the next, trimotors occupy the stage. Recently we witnessed a sortie in the direction of gliders; now there is noticeable activity preparatory to a general stampede toward light plane supremacy. One foresees a kind of oncoming mosquito fleet, composed of light, low-powered planes which, despite their large wings, will retain the aspect of smallness because of the manner in which they hug the ground.

There are many good reasons that the aircraft industry, as well as the public, should welcome this mosquito fleet. Much will be learned in the gradual process of development of these little jobs and innumerable problems applicable to large ships solved in safe and economical ways.

The fact that such planes possess little utility other than recreation for their owners requires that all costs incidental to them be reduced to the minimum, which in turn calls for aerodynamic cleanness, structural lightness with durability, and low-cost production methods. Ounces of weight and resistance must receive as much attention on the part of designers as pounds receive in larger ships. Moreover, a large increase in the number of planes in the air will bring to the front the problem of adequate visibility for pilots, which has been somewhat neglected in the past.

Within the next decade light planes probably will initiate hundreds of thousands of people, now passively interested in flying, into active participation and plane ownership. And many of these people will later become prospects for large and more luxurious ships and enthusiastic patrons of the lines.

It is well at this time, therefore, to consider thoroughly the effect of this latest trend on the industry as a whole, and to ponder on the probable requirements of the light private plane and how best they may be met. Immediate personal preferences for monoplanes or biplanes, open or closed jobs, tractors or pushers, gas or oil engines, and similar selections, should be carefully analyzed and strenuous efforts made to foresee the ultimate ship in this class and to encourage development in that channel.



Five typical historic airplanes in the "light plane" class

Just what constitutes a light plane has long been a matter of conjecture. Perhaps the phrase is a misnomer. The Department of Commerce definition of a low-powered airplane as one "having less than one-fifth of one horsepower per square foot of wing area" is a step in the right direction—yet, many so-called light planes will fall just outside that figure and be severely penalized structurally (and aerodynamically) unless a needed alteration is made in load factors.

The aircraft industry was founded by men who placed their faith in low-powered airplanes, and although there are more planes in each of many United States counties at the present day than there were in the entire world twenty-one years ago, we may well look back and see what the pioneers accomplished with light planes. In fact, were jobs of the Nieuport, Blériot and Santos-Dumont types available at reasonable prices today—somewhat cleaned up, of course—they might enjoy a good sale.

If the "Old-Timers" were short on horsepower—with their weak-lunged and temperamental engines—they were long on resourcefulness. The more we investigate their works, the more we are inclined to respect their prolific imaginations. The control system in almost universal use in light planes today is but a slightly modified form of the Blériot control of 1909. Again, many manufacturers today point with pride to the fact that their products incorporate tail wheels—which were used on numerous planes more than twenty years ago. And while on this subject it might be well to recall that all three wheels on the Blériot II were mounted as casters, a very sensible provision from the viewpoint of sideload landings on rough fields and one that may eventually come into vogue with the advent of compact-unit, steerable undercarriages.

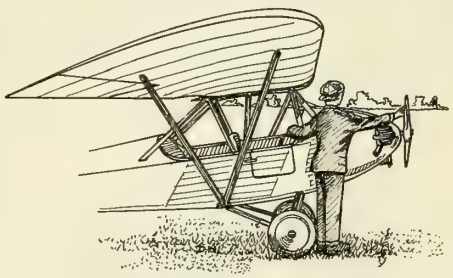
Five noteworthy examples of early light planes were the Wright and Curtiss biplanes and the Blériot, Santos-Dumont and Nieuport monoplanes. All were of 1909 vintage except the last named, which appeared the following year, and all except the little "Demoiselle" would fall within our Commerce Department's definition of low-powered aircraft. These representative types of early light planes wrote much aeronautical history. The Wright, a development of the first successful plane, monopolized flying records for several years; with his product Curtiss won the Gordon Bennett cup at Rheims in June, 1909, and made his historic Albany-New York flight on May 29th, 1910; in France, Santos-Dumont made the first successful flight in Europe on November 12th, 1903, in a box-kite and later developed the Demoiselle which proved popular; Blériot, originator of the monoplane type in 1906, crossed the English Channel from Calais to Dover in his Model II on July 25, 1909, using an Anzani engine of 23 horsepower; and in 1910 the Nieuport brothers brought out the first cloth-covered fuselage plane and presented the first

practical proof of the effectiveness of streamlining aircraft.

It will be noted that the two biplanes were pushers, the three monoplanes tractors. All were single-seaters except the Wright, and all were open jobs, only the Blériot and Nieuport cockpits being protected. On all jobs the wings were wired braced, and all except the Curtiss utilized wing warp for lateral balance. Three utilized balanced elevators and two of them balanced rudders; no two control systems were similar. Three incorporated three-wheel landing gears, and on four provision was made to prevent nosing over—either by use of a forward skid or wheel.

All engines were water-cooled excepting the three-cylinder fan-type air-cooled Anzani in the Blériot; all props were direct driven except the Wright, which utilized chain and sprocket drive to twin propellers; and all propellers were of relatively large diameters and turned over at sensible speeds ranging from 400 to 1,400 revolutions per minute. If present-day engine manufacturers persist in winding up their small engines at terrific speeds, it is probable that some form of reduction drive will have to be incorporated on slow speed light planes, which are more in need of propellers than of gasoline fans.

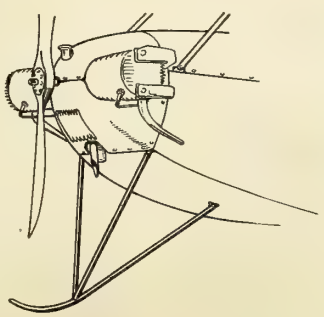
It might be added that the smallest and lightest ship in the group was the Santos-Dumont with a span of 18 feet and a gross weight of about 540 pounds; the largest and heaviest was the Wright with 41 feet and 1,100 pounds; the minimum horsepower used was 20 for the Nieuport, and the maximum 50 for the Curtiss. Incidentally, the Nieuport with its 52-mile-per-hour high speed was the fastest rig and the Blériot the slowest at 36. Wing loadings ranged from 2.05 pounds per square foot for the Wright to 5.40 for the Santos-Dumont and power loadings from 18 pounds per horsepower for the Santos-Dumont to 41 for the Wright.



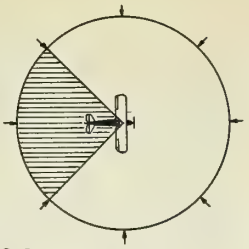
The light plane must be a one-man machine with safe and convenient starting arrangements

Thus we see that, although these relics of the bamboo, muslin and shoe thread era can be much improved upon using present day knowledge and materials, nevertheless many of their features must be retained—splendid tributes to the farsightedness of the pioneers.

Although the pioneers differed widely in their ideas as to what constituted a control system, they were practically unanimous in the matter of protecting their rigs against nose-over landings on rough fields, despite ridiculously slow landing speeds. Today schools and individuals are spending considerable sums of money in replacing broken propellers and making minor repairs from that cause. Occasionally the damage is of a serious nature, as for example in cases where the cabane or center section struts are welded directly to the fuselage and suffer derangement.



A simple, easily detachable nose skid is an inexpensive accessory



Only 25 per cent of the winds favor the flier

Low-powered planes cannot have their main wheels located very far forward of the center of gravity throwing a heavy load on the tail support, if a reasonably quick take-off is to be expected. Therefore some provision should be made against needless damage in nose-over landings, at least while the ships are being used in training.

A simple and easily detachable nose skid is an inexpensive accessory worthy of consideration in this connection, capable of effecting worth-while economies. The fuselage lugs to receive this unit may be of the simplest sort, adding but two or three ounces to the structure.

Let us consider the utility of the light plane, some form of usefulness obviously being necessary if customers are to be obtained. It might be used for business or pleasure, or for a combination of the two.

To the average owner, an automobile is a combined commercial and pleasure vehicle, business commuting being perhaps its principal use. A motor boat, on the other hand, is generally a pleasure craft, and similarly, the average man has little need for an airplane. His sphere of daily activity is limited—often within a radius that does not even include the town airport.

A light plane will have some value to many owners for occasional business trips, but certainly not enough to justify its costs—even of operating and maintenance. Thus the light plane falls within the luxury classification, and thoughtful manufacturers will, accordingly, make strenuous efforts to reduce all costs incidental to its ownership to the absolute minimum.

In order to enjoy a worth-while distribution, this type must seat at least two people. The present demand for several single-seaters exists only because no two-place jobs are competing with them in price, though the increase in price necessary for accommodating another passenger should not be more than 10 per cent. As with the motorcycle, the light plane owner must be enabled to offer his friends rides occasionally if he is to stay sold for very long.

Whether the seating arrangement should be in tandem or alongside is another matter of personal preference. The former permits of a body of less frontal area and therefore probably less resistance, whereas the latter is certainly the more sociable combination. Probably side seating two-place jobs will be slightly higher in power and price than their tandem competitors.

No matter what the seating arrangement used, however, there is absolutely no excuse for discomfiting passengers because of insufficient space and leg room. Seats should be large and well upholstered, with bottom cushions of a size interchangeable with 'chutes. Few light plane owners will be able to afford the latter, yet those who can do so are entitled to consideration. Likewise, general cockpit ar-

(*Continued on page* 126)

TOWLE ALL-METAL AMPHIBION FLYING BOAT



THE Towle Model TA-3 amphibion is powered by the Diesel engines of 225 horsepower each as standard equipment, but it is adaptable to either Wasp Juniors or J-6 Wright 300's. The first ship was flown on May 9, 1930, and since that time it has undergone the process of development based on hundreds of flights from rough water and bad landing fields. As a result of these tests the company believes that all service "bugs" have been corrected and that the ship is now ready to be put in the hands of the commercial operator.

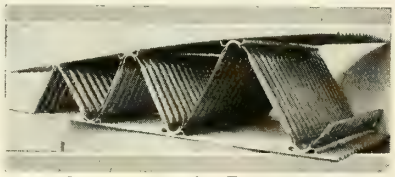
The ship was designed by Tom Towle, and all parts (except instruments, wheels and engines) are manufactured by the Towle Aircraft Company, Inc., of Detroit.

The design of this model is based on two preceding models of 1928 and 1929 —the Model WC, a twin-Comet-engined design, and the TA-2 with two J-6 Wright 165-horsepower engines.

The Packard Diesel powerplants have proved themselves ideal for this ship, giving quick take-off, elimination of fire hazard, 80 per cent decrease in fuel cost, absence of radio interference and cleanliness of operation. The ease of obtaining fuel for these powerplants became apparent last summer during tours through Ohio, Michigan, Indiana, Illinois and Wisconsin, where ordinary furnace oil was found to be readily obtainable.

The all-metal wing has no conventional spars, ribs or bays. The internal structure is of corrugated Alclad zigzagging fore-and-aft through the wing section and extending from one wing tip to the other. The corrugated sheet is flattened and bent at the points where it is sandwiched between the stringers. The whole unit, the outer skin, the stringers, and the sheet forming the trussing are riveted together in one operation. The outer skin is of corrugated Alclad and is so connected as to take a portion of the wing torsion.

The wing is resistant to torsion since it is virtually made up of nine triangular tubes, each in itself resistant to torsion. Furthermore, it may be considered that these nine tubes are made even more resistant to torsion by being enveloped in another metal tube or skin which has the cross-section area equal to the sum of these nine internal tubes. All of these triangular tubes are so well tied together



Structure of the Towle wing

that the problem of torsion is eliminated, as proved by the torsional wing test to destruction made upon a complete wing, by the Airplane Structures Section of the Army Air Corps at Wright Field.

Wing stress analyses do not require provision for any center of pressure movement on the Towle wing. The design was based upon the worst condition asked for; namely, high incidence load factors. Low incidence, inverted flight and diving are taken care of. The actual method of calculating wing stresses consisted in obtaining the moment of inertia of wing sections at several stations, about their neutral axes and injecting them into the bending moment stress formulas.

The airfoil section is that developed originally by Tom Towle in 1925. It is tapered in both plan form and thickness and has a lift-drift ratio of 16:2 and a high maximum lift coefficient of .00375, Army units. With the limited horsepower the top speed and landing speed are obtained by lesser wing area and a high lift coefficient, rather than the usual low drag and low lift wing section with its accompanying greater wing area. The maximum lift has the happy faculty of "hanging on" at high angles of attack. This effect is attributable to the wash-in of the wing tips. In this way the burble point of the center section, which contains the greatest percentage of wing area, is considerably delayed.

Particular attention is given to the prevention of salt water corrosion in the wing. All surfaces, both inside and out, are coated with a zinc chromate and aluminum pigment. All laps where it is possible for water and moisture to collect are coated with an asphalt paint. As a further precaution, the wing, hull and tail surfaces are provided with openings to force ventilation to all parts, a necessary feature often overlooked in combating corrosion.

In working up the hull lines, particular attention was given to seaworthiness. The high bow and concave V bottom permit it to be handled on rough water in an easy manner. The concave V bottom reduces pounding.

The hull and all parts of the ship are made of Alclad. All seams in the hull are of the lapped type. The lapped sheets have between them tape soaked in marine glue, and are riveted together with heat-treated duralumin rivets spaced five-eighths of an inch between the double rows and one-half-inch pitch between the rivets. The keel lap is treble riveted. With this method of riveting, local denting will not open up such a seam, a highly important item if such a condition involves the loss of a ship. Denting of this nature may happen quickly and without warning, sometimes under conditions that are far from ideal. The hull is divided into five water-tight compartments. Two steps are provided on the hull bottom. The second step far aft prevents porpoising on the water and shields the



The Towle amphibion in flight with landing wheels retracted

amphibion tail skid directly behind and adjacent thereto. Rubber discs are provided in the tail skid shock absorber. All internal parts are sprayed with a coating of bitumastic paint before assembly. The outside surface of the hull and pontoons are finished with aluminum pigmented lacquer. The cabin interior is finished in a cream color tone.

Control surfaces include ailerons, three rudders, three fins, one stabilizer and one large elevator. These are all covered with corrugated Alclad. The fin and stabilizer are braced by streamline struts. The main center fin supports all of the tail surfaces and is built into the hull. All movable surfaces are hinged on self-aligning ball bearings packed in oil soaked felt retainers.

The retractable landing gear has been simplified to operate in 20 seconds up or down. The operation is accomplished entirely by steel cables over ball bearing pulleys. The wheels are located 15 degrees ahead of the center of gravity. The wheel tread is 13 feet. The axle V is hinged to the hull by machined steel fittings directly above the sponson clamp. The vertical struts telescope and are positively locked by ¾-inch heat-treated square steel pins which are visible to the pilot at all times. Bendix wheels with new water-resisting brakes are used in combination with 36-by-8 inch tires.

The Packard Diesel engines are mounted as tractors, outboard and above the leading edge of the wing. In this position safety is increased, since the engines are not directly above or behind passengers. Objects such as cowlings carelessly placed cannot fall off and foul the propellers. Persons walking about the ship cannot walk into the propellers. The fact that the total horsepower is divided between two propellers offers greater propeller disc area per horsepower, giving unusual take-off. The engine mounts are supported on streamline chrome-molybdenum steel tube members which are sufficiently numerous to distribute the weight of the powerplant over the entire wing instead of concentrating it at only a few fittings.

Fuel and oil tanks are mounted directly behind the engines; these are not interconnected, since it is the aim to have each unit operate entirely independent of the other. The lubricating oil tanks are cylindrical in shape and have a capacity of seven gallons each. The fuel-oil tanks are also cylindrical and have a capacity of 45 gallons each. The latter are not cowled because their shape is such as to streamline the nacelles. Engine mountings are easily detachable by the removal of six bolts at the wing. The gravity fuel system consists of a three-foot Tightflex hose connecting the aluminum fuel tank to the Packard Diesel fuel ring. Since the Packard Diesel has no carburetors or magnetos, a valve is inserted in the fuel lines for emergency stopping of the engines. No fire prevention apparatus is provided since the ship is inherently fire-proof and carries no highly inflammable liquids. The Hamilton Standard propellers are nine feet in diameter and are adjusted to a pitch of 15.5 degrees. The Eclipse starters provided by the Packard Diesels are of the electric inertia type.

Engine controls are located in the center of the dash in the pilots' compartment, and can be operated individually or together with one hand. An Eclipse electric generator is installed on one engine to provide current for the six-volt Exide storage battery. Cabin, dash and navigation lighting are also operated from the single battery. Exhaust manifolds are made of aluminum sheet welded, since exhaust temperatures do not run high enough to endanger this material. The cabin is comparatively quiet by virtue of its insulation from the engines by the thick wing.

The pilot and co-pilot are seated forward and in a roomy compartment which has excellent visability. The pilots' seats are of the bucket type, upholstered with leather. They are provided with safety belts, and the co-pilot's seat can be folded out of the way when so desired.

Entrance is made from land by means of a walkway along the afterdeck of the hull to a stairway hatch immediately aft of the wing. On the water, entrance can also be made and moorings caught by passage through the pilots' compartment and out onto the forward deck, through doors above the pilots' compartment. Engines can be kept running while catching moorings, since there is no risk of coming in contact with the propellers.

Arrangement is made in the cabin to seat six passengers. The chairs are fixed to the floor and are provided with safety belts. They are made of steel tubing and are upholstered in cream colored Spanish leather. The ceiling has six dome lights. Cabin ventilation is secured by individual scoops placed at each seat. The fixed windows are of Duplate shatter-proof glass. At the rear of and adjacent to the cabin is the lavatory. The baggage compartment is located in the bow.

Surface controls are all operated by means of 5/32-inch flexible steel cable, except for the stabilizer adjustment which is actuated through a duralumin crank handle and torque tube. The dual control is of the throw-over type.

Instruments include turn-and-bank indicator, altimeter, rate-of-climb indicator, compass, oil temperature, and air speed indicator, electric tachometers and hydrostatic fuel guages on the dash.

Specifications

Span	56 feet
Chord at root	102 inches
Length overall	42 feet
Height overall	14 feet
Tread of wheels	13 feet
Weight empty	3,943 pounds
Gross weight	6,200 pounds
Total wing area	406 square feet
Wing loading	15.28 pounds per square foot
Power loading	13.20 pounds per h.p.
Wing load factor	5:45
Absolute ceiling	17,000 feet
Service ceiling	15,000 feet
High speed	120 miles per hour
Cruising speed	100 miles per hour
Fuel consumption	18 gallons per hour
Oil consumption	1½ gallons per hour
Water take-off	17 seconds
Land take-off	12 seconds
Rate of climb	800 feet per minute
Calculated stalling speed	63 miles per hour



The Towle twin Packard Diesel engined amphibion as it comes ashore

OBSERVATION AND BOMBING AIRPLANES OF GREAT BRITAIN

(PART I)

Paul E. Lamarche

IN previous articles of this series on British military aircraft I described the single-seater pursuit planes, or fighters as they are known among the British. The present descriptions are of observation and bombing planes produced by the British industry. These planes, according to their functions, are classified as army coöperation planes, general-purpose aircraft, high performance bombers, and day and night bombers.

The army coöperation planes are actually light observation types which, though not capable of as high performances as the new fast day bombers, are nevertheless indispensible in such military operations as artillery observation, photography, bombing, picking up of messages, reconnaissance and advanced training. They can, moreover, be used for bombing expeditions and long range reconnaissance. The military load generally includes two machine guns, photographic apparatus and wireless. Normally the range of the army coöperation ships is three and a half hours but extra fuel tanks can be carried in the wings which afford greater duration. The well-known Armstrong-Whitworth army coöperation plane, known as the "Atlas," has been adopted by the R. A. F. as a standard plane for this purpose, and more recently the Westland "Wapiti" has undergone modification for army coöperation work. In its modified form it is known as the Wapiti Mark V. Both of these planes carry defensive armament fired from both cockpits and at the same time can carry small bomb loadings, the Atlas being equipped to carry four 112-pound bombs.

Among the general-purpose planes produced in England are the well-known Westland Wapiti and the Fairey III F. The Avro "Antelope," more recently developed, is built primarily as a high performance day bomber but is at the same time suitable for service as a two-seater fighter, reconnaissance or general-purpose ship and has a maximum speed of 170 miles per hour at the 5,000-foot level.

Conspicuous among the newer high performance fast day bombers are the Fairey "Fox" and the Hawker "Hart" which are said to be the fastest machines of their type in the world today and which, because of their remarkably high performances, have become the talk of Europe. Although classed as day bombers, these planes have the speed and maneuverability of some of the most modern of single-seater fighters. During the air maneuvers over London two years ago, these ships were frequently able to break through the defenses of the single-seaters and out-maneuver them by their superior speed and rate of climb. Yet, in spite of their remarkable performances, these planes can carry a bomb load and are armed from both cockpits and therefore quite able to defend themselves from the attacks of the modern single-seater fighter. Though there is considerable secrecy about the performances of both of these small high speed day bombers, it is known that the Hawker Hart has a top speed of 187 miles per hour at an altitude of 10,000 feet with an all-up weight of 4,320 pounds when powered with the Rolls-Royce F. XI S. engine.

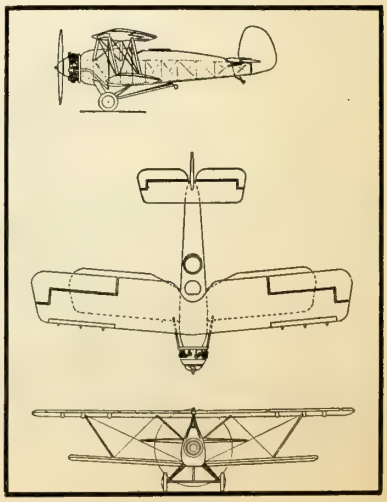
Among the heavier day bombers produced in England are the Handley Page "Hare" and the Hawker "Horsley." The standard high performance twin-engine day bomber of medium range is the Boulton and Paul "Sidestrand." Both the Hawker Horsley and the Handley Page Hare can be used as coast defense machines, carrying torpedoes suspended below their fuselages in place of the normal bomb loadings. They are described in this article, however, as day bombers, and as such, they present several interesting features. The Hare is the newest of this type of day bomber.

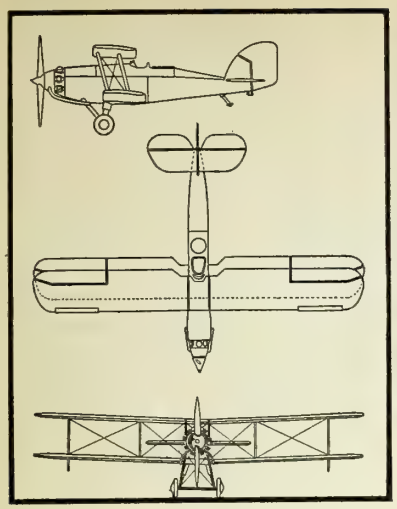
Principal among the night bombers used by the R. A. F. are the Handley Page "Hinaidi" and the Vickers "Virginia X," both of which planes are developed from planes first produced during the war. The Handley Page Hinaidi and the "Clive" are both descended from the well-known bomber of the World War, though the design of the Hinaidi might be said to be taken more directly from the more recent "Hyderbad," an older version of the Handley Page bomber which is still used extensively in Great Britain. The Clive is built as a troop carrier but can be converted into a bomber. The Vickers Virginia is a modernized version of the famous Vickers "Vimy" which saw much service during the war and which holds the distinction of being the first plane to make a non-stop flight across the Atlantic, Alcock and Brown having successfully crossed in a Vimy from Newfoundland to Ireland in 1919. At present a number of Vickers Vimy planes are being used in England for training purposes, though eventually the newer Virginia with its 3,000-pound bomb loading will replace them entirely. Like the Handley Page Clive, the Vickers "Victoria," which is built as a troop carrier, can be converted for use as a bomber. It will probably interest readers to know that the famous and venerable old D. H. 9, which saw so much service during the war both with the British and American air services, is still being used as a training plane by the 35th (Bombing) Squadron at Bircham Newton.

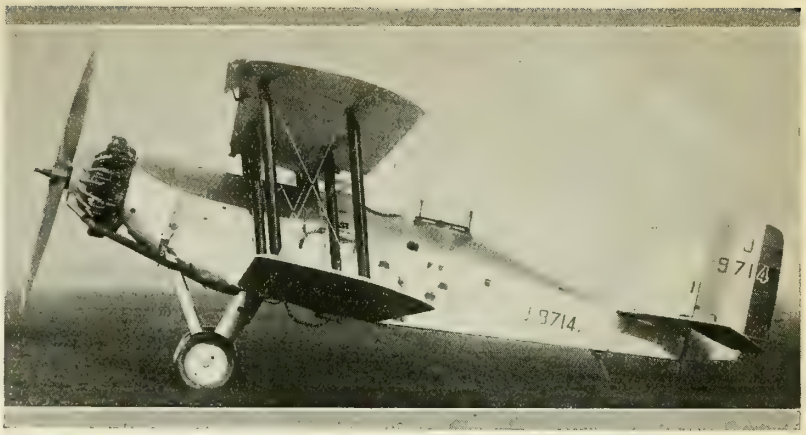
A number of the planes described in this article are also used by the Fleet Air Arm as seaplanes. The Armstrong-Whit-



Armstrong-Whitworth "Atlas" army coöperation two-seater of all-steel construction







The general-purpose Westland "Wapiti" Mark II A with Bristol "Jupiter" VIII engine

worth Atlas, the Westland Wapiti, the Fairey III F and the Hawker Hornet have all proved dependable as twin-float seaplanes, though in this article I am describing them as landplanes. On all of these planes photographic apparatus, wireless and bombing equipment are a part of the military loading. The defensive armament is usually one fixed Vickers gun firing through the propeller disc and one Lewis gun mounted on a Scarff ring over the observer's cockpit.

All of the observation and bombing planes of recent construction used in Britain now have all-steel structures, though on some types wood or metal is optional and several have mixed constructions. The fuselages are demountable in two or three sections for storage and transportation, and on one of the big night bombers described in this article the wings fold. Handley Page automatic slots are now fitted on all R.A.F. flying stock, and planes equipped with radial type air-cooled engines are being fitted with the Townend Ring which gives an appreciable increase in speed.

SIR W. G. ARMSTRONG-WHITWORTH AIRCRAFT, LTD.

The Armstrong-Whitworth Atlas

The Armstrong-Whitworth Atlas, which has been adopted by the Royal Air Force as a standard aircraft for army co-öperation, is built by Sir W. G. Armstrong-Whitworth Aircraft, Ltd., at Whitley, near Coventry. It is a two-seater biplane of all-steel construction well suited for land or sea reconnaissance and can be equipped with wheels, floats, or skis. Its military loading of 880 pounds includes two guns, a camera, wireless and message pick-up gear. When used as a long-distance reconnaissance plane, the normal fuel capacity of 75 gallons is increased by the addition of extra fuel tanks. As a light high speed day bomber, it can carry four 112-pound bombs. The Atlas can also be used as an advanced training plane. The Atlas is fitted with either a Armstrong-Siddeley "Jaguar" or a "Jaguar Major" air-cooled engine. When powered with the former, geared and supercharged and fitted with a Townend Ring, the Atlas has a maximum speed of 175 miles per hour. With direct drive Jaguar, not supercharged and not fitted with a Townend Ring, the Atlas has a maximum speed of 137.5 miles per hour at the same altitude of 15,000 feet.

The Atlas is a single-bay biplane the wings of which are staggered and of unequal span and chord. The upper plane is built up in two sections which are joined over the fuselage where they are supported by tubular steel struts. The wings are externally braced on either side of the fuselage by a pair of splayed out interplane struts of steel tube. The wings are of metal construction consisting of high tensile steel strip and solid drawn tube and bracing wires. They are covered with fabric. The structure of the spars consists of a pair of tubular booms riveted to a corrugated web. Tests at the plant at Whitley showed that this corrugated web has a strength thirty times greater than the steel strip web of flat surface. The wing ribs are built up from steel sections of simple construction consisting of a top and bottom boom which are tied together by a series of cross bracings. The upper wings are fitted with balanced ailerons, and Handley Page slots are optional.

The fuselage has an all-steel rectangular structure which has been faired to an oval section. It is built up with solid drawn high tensile steel tubes which are connected by machined fittings and braced by swaged wires. With the exception of the nose, the fuselage has a covering of fabric. In structure the fuselage is built up in two demountable sections: the forward includes the engine mount and cockpits; the aft section forms the tail. The pilot's cockpit is placed under a wide cut-out in the trailing edge of the upper wing, and that of the observer is immediately behind. The armament includes one Vickers gun fired through the propeller disc from the pilot's cockpit and one Lewis gun set over the observer's cockpit on a Scarff ring. The arrangement of the cockpit is well suited for carrying all of the equipment necessary for army co-öperation work.

The monoplane empennage has a metal construction similar to that of the wings and is fabric covered. There is no fin, and the rudder and elevators are balanced.

Specifications

Span	39 feet 6 inches
Length	28 feet 6 inches
Height	10 feet 6 inches
Chord, upper wing	6 feet 7 inches
Chord, lower wing	5 feet 7 inches
Gap	5 feet 6 inches
Wing Area	391 square feet
Fuel capacity	75 gallons
Weight loaded	4,115 pounds
Military load	880 pounds

Performance

(With geared Armstrong-Siddeley Jaguar engine fitted with Townend Ring)

Speed, ground level	149 miles per hour
Speed, 5,000 feet	145 miles per hour
Speed, 10,000 feet	140 miles per hour
Speed, 15,000 feet	131 miles per hour
Climb to 5,000 feet	4.25 minutes
Climb to 10,000 feet	10.5 minutes
Climb to 15,000 feet	21.75 minutes
Absolute ceiling	19,100 feet
Service ceiling	17,700 feet
Endurance	3¼ hours

Performance

(With geared supercharged Armstrong-Siddeley Jaguar Major with Townend Ring)

Speed, 10,000 feet	170 miles per hour
Speed, 15,000 feet	175 miles per hour
Speed, 20,000 feet	168 miles per hour
Climb to 10,000 feet	12.5 minutes
Climb to 15,000 feet	16.4 minutes
Climb to 20,000 feet	22.5 minutes
Absolute ceiling	28,000 feet
Service ceiling	26,700 feet
Landing speed (with slots)	54 miles per hour
Endurance	3¼ hours

WESTLAND AIRCRAFT WORKS

The Westland Wapiti

The Westland Wapiti, which is built by the Westland Aircraft Works of Petters Limited at Yeovil in Somerset, is a general-purpose plane used extensively by the Royal Air Force, the Royal

(*Continued on following page*)

(Continued from preceding page)

Australian Air Force and the South African Air Force. The Wapiti Mark II-A, which is fitted with a Bristol Jupiter VIII air-cooled engine, can be fitted with floats or with skis. Recently the Westland Aircraft Works developed an army coöperation plane, known as the Wapiti Mark V, which has a longer fuselage than the Mark II-A, a braked chassis and a tail wheel. Since the army coöperation Wapiti is analagous in construction to the general-purpose plane, a description of the latter will suffice.

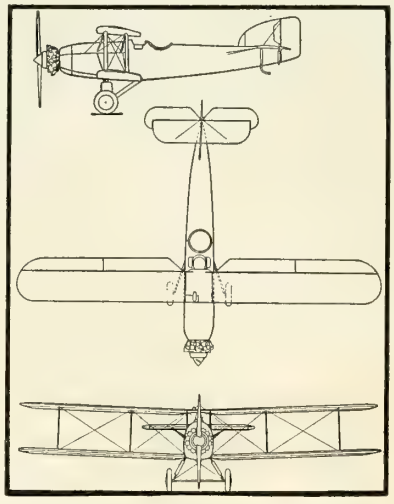
The older types of Wapiti general-purpose planes were of mixed constructions, but now these ships are constructed entirely of metal.

Three different sets of wings can be supplied with the Wapiti as well as various forms of landing gear. Formerly the wing structures were composed of wooden spars and ribs, but what is generally regarded as the standard wing now has an all-metal structure covered with fabric. The Wapiti Mark II-A is a staggered two-bay biplane—upper and lower wings of equal span. The upper wing has two outer sections attached to a center section which is carried above the fuselage on four cross braced struts. There are two pairs of steel interplane struts on either side. Both upper and lower wings are fitted with Frise ailerons, and Handley Page slots are considered as standard.

The fuselage of the Wapiti, which has a rectangular section with a domed top, is built in three all-metal sections. The structure of the fuselage is composed of square duralumin and steel tube, the latter being used on portions where the stresses are greatest. In the forward section strut bracing is used; tie-rod bracing is used aft. The first two sections of the fuselage have a covering of aluminum with longitudinal corrugations every six inches to add stiffness. The rear portion is fabric covered.

The pilot occupies the forward cockpit under the trailing edge of the top plane, and the observer's cockpit is immediately behind. The armament consists of one Vickers gun carried on the left side and firing through the propeller from the pilot's cockpit and one Lewis gun mounted on a Scarff ring over the observer's cockpit. The Wapiti can also carry a bomb load of 580 pounds with a total military loading of 1,108 pounds. Included in this loading is a camera carried behind the observer, oxygen supply for the pilot and observer, and wireless equipment.

The empennage is of the monoplane type with metal frames covered with fabric. The rudder is balanced and the stabilizer adjustable in flight. The standard undercarriage is of the split-axle type, the rear legs of which incorporate Westland oleo-pneumatic shock absorbers. A number of different types of motors can be used on the Wapiti, although a direct drive Bistol Jupiter VI or a Jupiter VIII geared air-cooled engine is most frequently installed. Fuel is carried in two fuselage tanks of 120 gallons total capacity, the main tank having a capacity of 68 gallons and the gravity service tank 40 gallons capacity. For long distance, such as in the deserts, where many of these ships are used by the R. A. F., in the British colonial possessions, a 23-gallon fuel tank can be installed for extra fuel. Normally 10 gallons of oil are carried, though the desert loading is 15 gallons.



The normal range of the Wapiti is 500 miles, but with extra fuel tanks the range is 620 miles.

Specifications

(With the geared Bristol Jupiter VIII engine)

Span	46 feet 5 inches
Length	32 feet 6 inches
Height	11 feet 10 inches
Wing chord	5 feet 9 inches
Wing area	488 square feet
Track of landing gear	7 feet
Weight empty	3,050 pounds
Weight with normal military load	4,900 pounds
Weight with loading for desert use	5,450 pounds
Normal fuel capacity	108 gallons
Normal oil capacity	10 gallons
Range	500 miles
Desert Range	620 miles
Speed, 5,000 feet	142 miles per hour
Speed, 10,000 feet	140 miles per hour
Speed, 15,000 feet	137 miles per hour
Landing speed	58 miles per hour
Climb to 5,000 feet	4 min. 8 sec.
Climb to 10,000 feet	11 minutes
Climb to 15,000 feet	15 min. 2 sec.
Service ceiling	32,000 feet

FAIREY AVIATION CO., LTD.

The Fairey III F

The Fairey III F is one of the most versatile and extensively used of general-purpose planes produced in Great Britain. It is said that there are more than 200 of these planes in use in different parts of the world at present. They have in recent years gained wide recognition because of their good all-'round performances in flights between Cairo and Capetown, and they are used extensively in the British Dominions. The general-purpose plane is almost identical with the Fairey III F seaplane, used by the Fleet Air Arm, and is adaptable to many different and varied requirements. It is built both as a two- and a three-seater biplane and can be fitted with a variety of both air- and water-cooled motors of a power range of 460 to 600 horsepower. The III F general-purpose plane is built by the Fairey Aviation Company, Limited, at Hayes, in Middlesex, and is an equal wing unstaggered two-bay folding wing biplane. It is interesting to note that welded construction is employed in these planes probably more than in any other military aircraft produced in Great Britain.

The wings can be constructed either of metal or wood, though the use of metal predominates on aircraft of recent production. The upper wing includes a center section, which is supported above the fuselage by tubular steel struts. There are two sets of parallel interplane struts of tubular steel on either side of the fuselage. When the wings are of metal construction, they are built up with two spars of drawn corrugated steel tube and ribs of duralumin with pressed webs, fabric covered. The ailerons are fitted on all four wings and have flap gear. Handley Page slots are fitted to the upper wings.

The III F has a long fuselage of good



Fairey III F, one of the most extensively used in its class

streamline form which has a rectangular section faired to oval. The forward part is covered with easily demountable aluminum panels and the tail section with fabric. The fuselage usually is entirely of metal tube construction, though wood construction is sometimes used in the aft section.

When there are accommodations for three, the center cockpit is occupied by a radio operator. The forward cockpit, occupied by the pilot, is placed under the trailing edge of the top plane, while the gunner-observer occupies the rear cockpit. Considerable equipment may be carried in the fuselage. A camera is mounted towards the rear of the aft cockpit over a movable trap door in the floor, and the wireless equipment carried can be operated by either the pilot or the observer. The armament consists of a Vickers gun mounted in a tunnel in the left side of the fuselage and fired through the propeller disc from the front cockpit. Provision is made to carry various bomb loadings— two 230-pound bombs, or four 112-pound bombs, or eight 20-pound bombs. All bombs are carried beneath the lower wings.

The empennage is of the normal monoplane type of metal construction covered with fabric. The rudder is balanced and the incidence of the stabilizer is adjustable in flight. The landing gear is of the cross-axle type with oleo-pneumatic shock absorbers on the front legs. The Fairey III F is usually fitted with a 570-horsepower Napier Lion, a Rolls-Royce F water-cooled engine, or an Armstrong-Siddeley Jaguar air-cooled engine. The engine is mounted on a welded steel tube structure and is separated from the front part of the fuselage by a fireproof bulkhead. The fuel capacity is normally 124 gallons.

Specifications

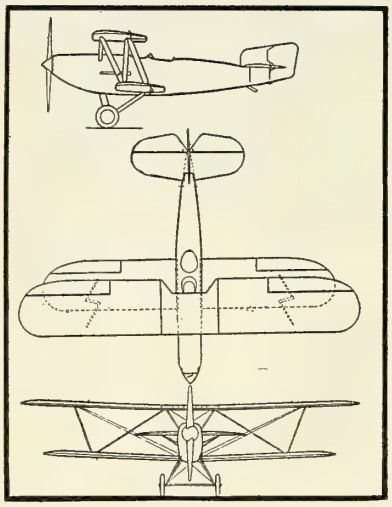
Span	45 feet 9 inches
Span, wings folded	14 feet 3½ inches
Chord	5 feet 8 inches
Length overall	32 feet 6 inches
Height overall	11 feet 6 inches
Fuel capacity	124 gallons
Range at cruising speed	700 miles

THE FAIREY FOX

The Fairey Fox is a light two-seater high performance day bomber of composite wood and metal construction. It is powered with a Rolls-Royce F engine. Although performance data remain an Air Ministry secret, the plane has proved to be a machine of very high performance and great maneuverability. This type of machine was originally introduced to meet the need for a small fast day bomber with fighter performance. The Fox is an unusually beautiful plane having very clean lines and a particularly well streamlined fuselage for a bomber. The Rolls-Royce engine, with its small frontal area, allows unusual refinement of the nose. All accessories are carried within the fuselage. The wings are of the single-bay type. Further reduction of parasitic resistance is accomplished by the use of a wing radiator which is carried in the center section of the upper wing in addition to the retractable underslung radiator. Evidently many of the refinements of streamlining first used on the Schneider Cup racing planes have been applied to the Fairey Fox.



Fairey "Fox" high performance day bomber with Rolls-Royce engine



The wings are of unequal span and staggered. There is one set of N interplane struts on either side of the fuselage. The upper wing has two outer sections attached to the center section which is carried above the fuselage on four splayed out struts. In structure the wings are built up with wooden box spars and wooden ribs covered with fabric. Ailerons are fitted to all four wings.

The fuselage is oval in form. It is of mixed construction. The central portion of the fuselage, to which are attached the engine mount, the wings and the landing gear, is of tubular steel construction. The rear portion is of ash and spruce, braced by swaged rods. The pilot's cockpit, which is under the cut-out in the upper wing is armed defensively with a Vickers gun which is mounted in a tunnel on the left side. The observer-gunner's cockpit immediately behind is provided with a folding seat. When this seat is folded and a trap door on the bottom of the fuselage is opened, a prone position for bombing may be assumed. The bomb sight is attached to the opening of the trap, and the release controls are arranged on the right side of the cockpit floor. The observer-gunner's cockpit is also armed with a Lewis gun mounted on a Fairey special type of mounting. The bomb loadings provide racks, carried underneath the lower wings, either for two 230-pound bombs or four 112-pound bombs. The Fox has complete wireless apparatus.

The empennage is of the normal monoplane type with a balanced rudder and an adjustable stabilizer. The landing gear is of the cross-axle type with oleo-damped rubber shock absorbers. The fuel tanks, as well as the oil supply, are carried in the fuselage. The oil is cooled by a surface radiator in the slipstream of the propeller. Performance and loading data are still a closely guarded Air Ministry secret so that I am able to give only a few dimensions.

Specifications

Span	38 feet
Chord of wings	5 feet 6 inches
Length overall	33 feet 8 inches
Height	10 feet 8 inches

(To be concluded in the March issue.)

FULL SCALE TESTS OF PROPELLERS

TESTS were conducted in order to determine how the characteristics of a propeller are affected by cutting off the tips. As is recorded in N.A.C.A. Report 351, by Donald H. Wood, the diameter of a standard 10-foot metal propeller was changed successively to nine feet six inches, nine feet, eight feet six inches, and eight feet. Each propeller thus formed was tested at four-pitch settings in the Propeller Research Tunnel of the National Advisory Committee for Aeronautics using an open-cockpit fuselage and a D-12 engine.

A small loss in propulsive efficiency is indicated. Examples are given showing the application of the results to practical problems.

THE SWANSON COUPE

THE Swanson Aircraft Company, Inc., of Hopewell, Virginia, is now producing its cantilever monoplane known as the Swanson Coupe, Model W-15, recently approved by the Department of Commerce, and powered by the Warner Scarab seven-cylinder 110-horsepower radial engine.

The Swanson Coupe is entirely void of struts and wire bracing, allowing an unobstructed view to both pilot and passenger. Its cabin construction is so arranged to give full view from above, by the design of a special wing truss, which is fully covered by pending patents. The special wing truss is designed not only to allow full overhead vision, but to allow the anchoring of the wings in such a manner as to dispense with the use of struts and other external bracings, retaining the cantilever type of wing without the use of a front wing beam extending the entire length of the wing and through the cabin, which is found in other cantilever types of modern aircraft, thereby prohibiting the use of the overhead vision feature.

The Swanson Coupe is so designed and constructed as to have good stability. The dual controls are so designed that only a short time is consumed in either installing or removing the student controls. The stabilizer control is conveniently located above the pilot's right shoulder.

The cabin, which is comparable in appointments with a coupe automobile, having a wide door on either side with adjustable glass windows, is handsomely upholstered and finished in Chase mohair fabric. The seats are so arranged that, by removing the top section of the cushion, the space is exactly filled by a seat pack parachute. The springs in the bottom section of the cushion make a very comfortable arrangement even when a 'chute is worn. A luggage compartment, large enough for two suitcases is provided immediately aft of the seat.

The fuselage is of welded steel tube construction and, to reduce fire hazard, is aluminum covered to a point just aft of the cabin. The remaining portions of the fuselage and the tail surfaces, which are of welded steel construction, are covered with Flightex fabric.

The wings are of customary wood construction and are also covered with Flightex fabric. The spars are built up box section of spruce with two-ply mahogany planking, and the ribs are of spruce with mahogany plywood reinforcements. The leading edge is covered with sheet aluminum. Steel compression struts and square section Hartshorn tie rods are used for internal bracing. The ailerons are swung on Fafnir ball bearings and are operated by torque tubes concealed within the wing. The wing panels are attached to aluminum covered stubs which extend 16 inches from the fuselage by very simple fittings and can be easily attached or removed in 40 minutes. No external wing bracing is used. The wings may be removed any number of times without affecting the alignment, but provision is made for changing the rigging of either panel, an ordinary wrench being the only tool required. The aluminum covered stubs carry two 20-gallon fuel tanks, making it unnecessary to disturb any piping when the wing panels are dismounted. The fuel supply is conveyed from the gasoline tanks to the filter by a special arrangement of feed lines, making it improbable that the engine will fail as a result of chokage of fuel lines.

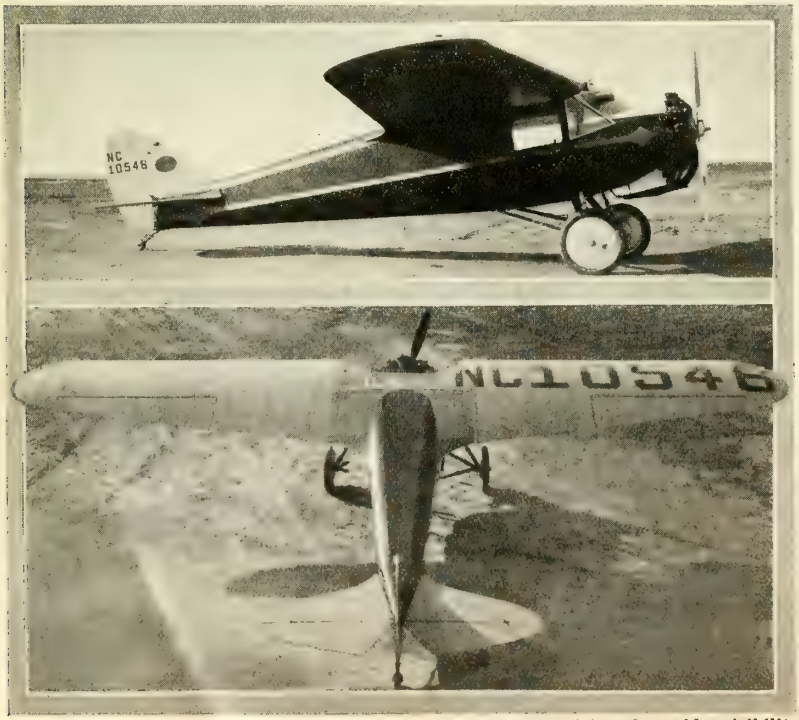
The landing gear is of the split type and has oildraulic shock absorbers, removable axles, semi-balloon tires and brakes. The brakes are operated by a control mounted on the instrument board and accessible from either seat. With the brakes and control thus arranged, with full caster tail wheel, ground handling and taxying are extremely easy.

The Swanson Coupe was designed by S. Swanson, who has been chief engineer for the Lincoln-Standard Aircraft Company of Lincoln, Nebraska, for the Arrow Aircraft Corporation and for the Kari-Keen Aircraft Company of Sioux City, Iowa.

All structural parts of the Swanson Coupe are built in rigid jigs and are completely interchangeable without hand fitting.

The Swanson Coupe is offered in two models—standard and deluxe. The equipment on both models consists of dual controls, low-pressure semi-balloon tires, laminated safety glass, two conveniently located electric gasoline gauges, electric oil level gauge, tachometer, altimeter, oil pressure and temperature gauges, customary engine controls and one quart Pyrene fire extinguisher.

The deluxe model is equipped with Eclipse direct cranking starter, engine-driven generator, special aircraft storage battery, navigation and landing lights, cabin and instrument board lights, Hamilton-Standard metal propeller, heater and extra instruments, including a compass, air speed indicator, clock, bank indicator, ammeter, switches, etc.



The Swanson Coupe, showing full cantilever wing and provision for wide visibility

Specifications

Span	34 feet 4 inches
Length overall	25 feet
Height	7 feet 7 inches
Mean chord	6 feet
Wing area	180 square feet
Aileron area	20 square feet
Weight empty, standard equipment	1,325 pounds
Weight empty, deluxe equipment	1,400 pounds
Useful load, standard equipment	725 pounds
Useful load, deluxe equipment	650 pounds
Payload, standard equipment	295 pounds
Payload, deluxe equipment	220 pounds
Gross weight, deluxe equipment	2,050 pounds
Power loading	18.65 pounds per horsepower
Fuel capacity	40 gallons
Oil capacity	3 gallons
High speed	125 miles per hour
Cruising speed	95 miles per hour
Landing speed	40 miles per hour
Cruising radius	625 miles
Duration	6½ hours
Rate of climb from sea level:	
Light	1,000 feet per minute
With full load	700 feet per minute
Absolute ceiling	16,000 feet

RECENT AIRCRAFT PATENTS

THE following patents of interest to readers of AERO DIGEST were recently issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N. W., Washington, D. C., at the rate of 20 cents each. State number of patent and name of inventor when ordering:

Aeroplane. Charles P. Delo, Knox, Pa. (1,781,371).

Accommodation of liquids in flying-machines. Claudius Dornier, Friedrichshafen-on-the-Bodensee, Germany (1,781,466).

Aeroplane. Ignatz Glanschnig, Gary, Ind. (1,781,455).

Illuminating device for aircraft. Samuel Wiley, Metuchen, N. J. (1,781,621).

Automatic control for aeroplanes. Riccardo Fedrizzi, Weston, Pa. (1,781,633).

Aeronautical propeller. Sylvanus A. Reed, New York, N. Y.; assignor to Reed Propeller Co. (1,781,883).

Flying-machine. Severin C. Anker-Holth, Los Angeles, Calif. (1,781,910).

Arrangement of engines on aircraft. Adolf Rohrbach, Berlin-Wildmersdorf, Germany; assignor to Rohrbach Patents Corp., Delaware. (1,782,013).

System for preventing the formation of ice on aircraft. Frank McKinstry, Nashville, Tenn. (1,782,072).

Safety equipment for aircraft. Donald G. Coplen, Seattle, Wash. (1,782,134).

Stabilizer for aeroplanes. Hervey M. Salisbury, Walnut Grove, and Arthur E. Miller, Sacramento, Calif. (1,782,149).

Variable-pitch propeller. Clarence K. Greene, Cananea, Mexico (1,782,167).

Aeroplane. Toichi Nose, Kamakura Machi, Japan (1,782,210).

Aeroplane. Federico G. Diago, Havana, Cuba (1,782,256).

Rudder and brake control. Edgar R. Weaver, Dayton, Ohio (1,782,524).

Airplane control. William Stelzer, Chicago, Ill.; assignor to Bendix Aviation Corp., New York, N. Y. (1,782,750).

Aero auxiliary cylinder. John H. Wheeler, Columbus, Ohio (1,782,753).

Apparatus for making exposures of the path or route of flying-machines or the like. Ernst Reipert, Nowawes, Germany (1,782,860).

Aerial camera. Ambrosius Briechle, New York, N. Y.; assignor to Fairchild Aerial Camera Corporation, New York (1,782,864).

Aeroplane. Richard H. O'Massey, Denver, Colo. (1,782,878).

Aeroplane. Lawrence L. Johnson, Los Angeles, Calif. (1,782,965).

Flying-machine. Daniel P. McLaughlin, Chicago, Ill. (1,783,024).

Ornithopter. George R. White, Stony Brook, N. Y. (1,783,029).

Device for throwing at will projectiles from aircraft. Franciscus W. van Heijst The Hague, Netherlands (1,783,145).

Propeller. Thomas A. Dicks, Pittsburgh, Pa.; assignor to Pittsburgh Screw & Bolt Co., Pittsburgh. (1,783,225).

Starting of large flying machines. Claudius Dornier, Friedrichshafen, Germany; assignor to Dornier-Metalbauten, Friedrichshafen. (1,783,227).

Aerofoil construction. Nelson W. Dalton, Bath, N. Y. (1,783,413).

Parachute cord retainer. Andrew H. Reed, Kansas City, Mo. (1,783,452).

Vertical lift airplane. George W. Windsor, Sacramento, Calif. (1,783,458).

Aeroplane control. Waldo D. Waterman, Santa Monica Canyon, Calif. (1,783,529).

Airplane. Henry H. Simon, Greenville, S. C. (1,783,590).

Bomb sight. Mortimer F. Bates, Brooklyn, N. Y.; assignor to Sperry Gyroscope Co., Brooklyn. (1,783,769).

Device for carrying heavy bodies on and releasing them from aircraft. Albert E. Jones, Westminster, London, England; assignor to Vickers-Armstrong, Ltd., London. (1,784,011).

Aircraft construction. Warren M. Piggott, Bay City, Mich. (1,784,027).

Process and apparatus for atomizing materials from moving aircraft. Nicholas E. Oglesby and Fleming R. Weaver, Edgewood, Md. (1,784,157).

Parachute harness. Floyd Smith, Morrisville, Pa.; assignor to Switlik Mfg. Co. (1,784,162).

Airplane skid. Frederick S. Cotton, London, England. (1,784,274).

Aircraft. Romulus Bratu, Paris, France. (1,784,654).

Aircraft. Manuel H. de Hora, New York, N. Y. (1,784,723).

Airship. Louis B. Balazinski, East Port Chester, Conn. (1,784,775).

Airplane propeller. Frank A. Dumont, Shelton, Wash. (1,784,894).

Aerial navigation instrument. Georges Estoppey, Dayton, Ohio. (1,784,929).

Aeroplane. Fitz R. Longstreet, Gainesville, Ga. (1,784,939).

Apparatus for releasing glider planes. Oscar Alvistur, Oakland, Calif. (1,784,954).

Airplane. Francis A. Doyle and George A. Lyons, Springfield, Mass. (1,785,114).

Aeroplane. Anthony Lanzetta, Bronx, N. Y. (1,785,128).

Aeroplane. John A. Cashel, Worthington, Minn. (1,785,295).

Rolling apron for airplane wings. Filiberto de la T. Castelcicala, Rome, Italy. (1,785,300).

Aeroplane steering apparatus. Romeo Guilemette, Taunton, Mass. (1,785,306).

Wing structure for airplanes. William C. Lambert, Ironton, Ohio. (1,785,318).

Helicopter. Serge Trey, Stamford, Conn. (1,785,333).

Shock absorber for landing gears of airplanes. Elliott Daland, Torresdale, Pa.; assignor to Keystone Aircraft Corp., Bristol, Pa. (1,785,339).

Pneumatic aircraft propelling means. Otto K. Quast, Spokane, Wash. (1,785,458).

Airplane. Thomas F. Cooney, Las Cruces, N. Mex. (1,785,477).

Metal propeller. Claudius Dornier, Friedrichshafen, Germany; assignor of one-half to Dornier-Metallbauten, Friedrichshafen. (1,785, 543).

Fuselage fitting. Giani Caproni, Rome, Italy. (1,785,615).

Control surface for aircraft, submersibles, and the like. Leslie G. Frise, Bristol, England; assignor to Bristol Aeroplane Co., Ltd., Bristol, England. (1,785,620).

Aircraft. Stefan F. Kumor, Chicago, Ill. (1,785,633).

Elapsed-time register for airplanes. Clyde C. Brant, Terre Haute, Ind. (1,785,724).

Aircraft. Carl H. Iwanowiz, Souderton, Pa. (1,785,775).

Airplane control. William B. Stout, Detroit, Mich.; assignor to Ford Motor Co., Highland Park, Mich. (1,785,879).

Stub wing for flying boats. Claude Dornier, Friedrichshafen, Germany, assignor of one-half to Dornier-Metallbauten, Friedrichshafen. (1,785,892).

Steering aircraft. Albert Presser, Friedrichshafen, Germany; assignor to Dornier-Metallbauten, Friedrichshafen. (1,785,913).

Helicopter. George Matta, Braddock, Pa. (1,786,017).

Aeronautical indicator. William Fraser, Arvida, P. Q. (1,786,059).

Airplane. Lloyd Stearman, Wichita, Kans.; assignor to Stearman Aircraft Co., Wichita. (1,786,136).

Safety parachute device for aeroplanes. Vincenzo Pellegrino, Rye, N. Y. (1,786,169).

Aeroplane. Jerry S. Walter, Seminole, Okla. (1,786,181).

Aeroplane control device. McClellan Davis, Portland, Ore. (1,786,193).

Aircraft wing. Jonathan P. Glasby, Jr., Verona, N. J. (1,786,236).

Stabilizing device for aeroplanes. Edward G. Schleichter, Mt. Vernon, N. Y. (1,786,266).

Aeroplane. Hobard R. Kriegh, Albany, Calif. (1,786,307).

Propeller mechanism for aircraft. Frank Donohue, Jr., New York, N. Y. (1,786,338).

Airfoil. Paul C. Yates, Houston, Tex. (1,786,472).

Aeroplane for horizontal and vertical flight. Jacob E. Noeggerath, Berlin, Germany. (1,786,545).

Helicopter. Harry T. Nelson, Dallas, Tex. (1,786,576).

Screw propeller. David E. Davis, Los Angeles, Calif. (1,786,644).

Airplane landing device. Augusto C. Gonzales, Reno, Nev. (1,786,649).

Controlling means for airplanes. George W. Lyons, Hayden, Colo. (1,786,668).

Parachute. Charles Fisher, San Francisco, Calif. (1,786,838).

Air speed indicator. Walton Gilbert, Pasadena, Calif. (1,786,841).

Aeroplane phonograph reproducer. James M. Coburn, Kansas City, Mo., assignor to Plane Speaker Corp., New York, N. Y. (1,786,982).

Safety aircraft. Willis C. Ward, Orchard Lake, Mich. (1,787,293).

Glider plane. Joseph C. Yecker, Lancaster, Pa. (1,787,297).

Airplane wing. Matthew Orr, Dillon, Mont. (1,787,321).

Aeroplane wing. William S. Hall, San Antonio, Tex. (1,787,370).

DIGEST OF FOREIGN TECHNICAL ARTICLES

By Elsa Gardner

FRENCH AIRPLANES

The New Airplanes of the Twelfth Paris Exhibition (Les avions, nouveaux du 12e Salon de Paris) P. Leglise. "Aeronautique," Vol. 12, No. 139, December, 1930, pp. 426-491, 161 figs.

A DETAILED description of all the new French airplanes shown at the Paris exhibit is given with halftones and linecuts illustrating various parts of the construction that differ from standard airplane design.

Among these are included: the Bernard 120 Schneider Cup seaplane, Blériot 110 long-distance monoplane, Blériot 125 bi-fuselage monoplane, Breguet 27. all-steel plane, Breguet 390-T transport plane, C.A.M.S. 58 commercial seaplane, C.A.M.S. 80 three-place observation seaplane, trimotored Couzinet 30 120-horsepower low-wing monoplane, Dewoitine D. 30 transport monoplane, Latécoère 380 trans-Atlantic transport and mail plane, trimotored Latécoère 350 transport monoplane, Farman 230-A sport low-wing monoplane, Guillemin J. G. 40 ambulance or mail plane, Levasseur three-place observation P. L. 11 and P. L. 12 light seaplanes, Lorraine-Henriot LH 21S ambulance and LH 10 training planes, Lioré et Oliver LeO. H. 22 amphibion mail plane, Lioré et Olivier LeO. H. 27 four-motored 2,400-hp. seaplane, Mauboussin M. 10 and M11 planes, Morane-Saulnier 301 training and 224 pursuit planes, Mureaux A.N.F., 111 R-2, and 120 R.n. 3 night-bomber planes, trimotor colonial Potez 40 monoplane, Nieuport-Delage 540 transport plane, two-engined Amiot 140 M. monoplane of the S.E.C.M., trimotor S.P.C.A. 40 T mail plane, trimotored Wibault 280 T. 10 transport monoplane, three-place, Weymann W.E.L. 52 sport plane, and the new dirigible V2-27 designed for the Navy.

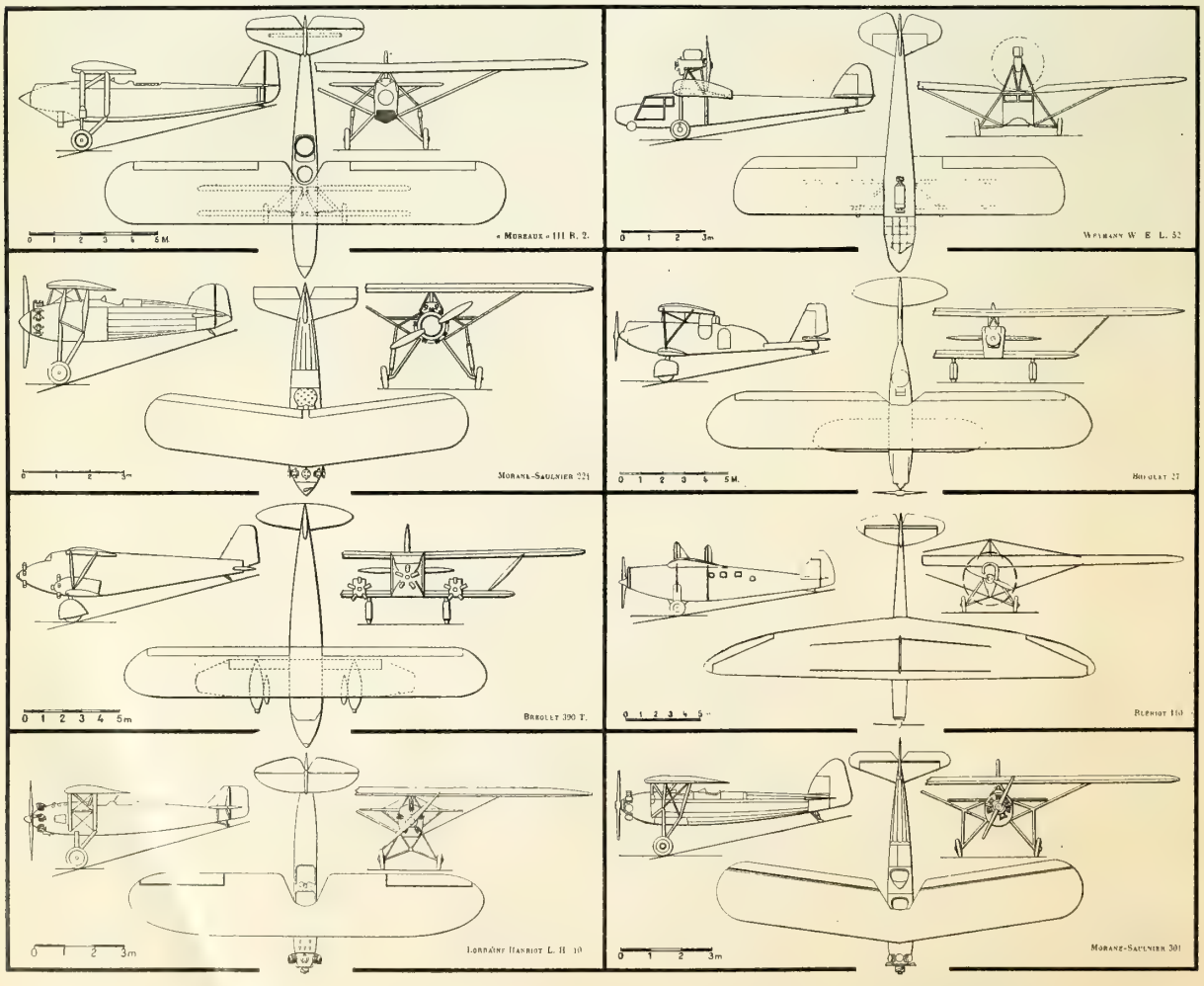
AIRPLANE FIXTURE DESIGN

Elements of Detail Design, F. Radcliffe. Royal Aeronautical Society Journal, Vol. 34, No. 239, November, 1930, pp. 936-959, 22 figs., 12 tables.

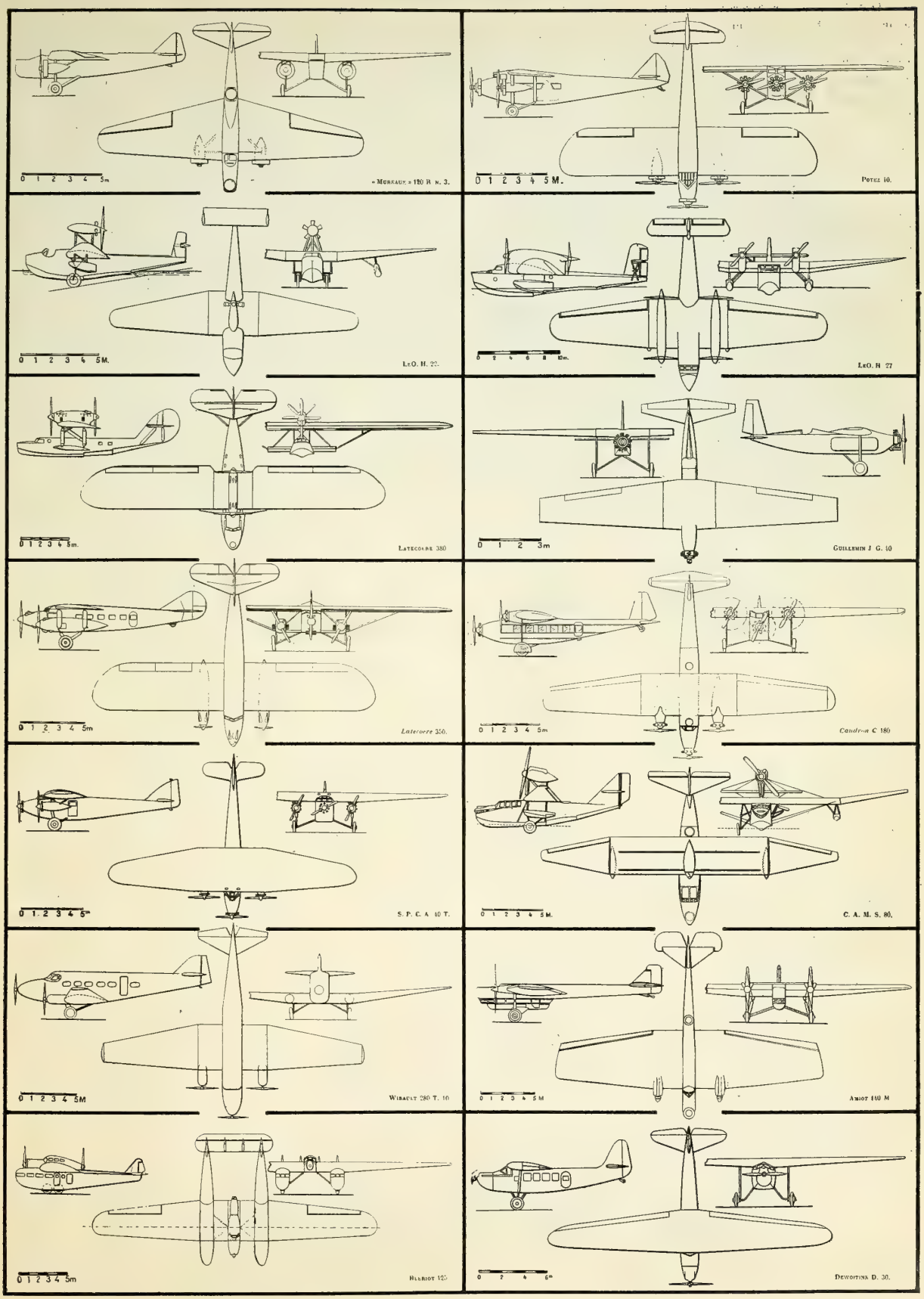
PROBLEMS of the aircraft draftsman in the design of joints and fixtures for primary structural members of airplanes are discussed, with reference to the significance of the British load factors. The choice of materials from the standpoint of maximum efficiency and of economics is taken up. A precis of the information contained in the specifications issued by the B.E.S.A. and Air Ministry is given.

Results of tests of riveted joints in thin plates are quoted, and the author points out the high crushing stress which can be developed by relatively soft materials when used for riveting together thin plates and that riveted joints have failed in most cases by the shearing of the rivet or by the instability of the plates causing the plate to buckle and tear. He recommends that solid rivets arranged to act in single shear in thin plates will always be more efficient than rivets arranged in double shear when the ratio of rivet diameter to plate thickness is greater than two; that tests do not show that the so-called frictional grip of the rivet head helps in raising the strength of a small rivet in thin plates and should not be assumed; that a factor of safety be introduced so that rivet joints shall not develop "slop" after extensive flying service; that hollow rivets in thin plates require special attention

(*Continued on following page*)



Latest French airplanes shown at the Paris Exhibition. (Drawings courtesy of "Aeronautique")



Some typical modern French airplanes exhibited at the recent Paris Aero Salon. (Drawings courtesy of "Aeronautique")

(*Continued from preceding page*)

to the possibility of additional form of failure; that stainless steel rivets give considerable amount of trouble in shops and only low values of shear stress can be developed.

The author also suggests designs for machined socket attachments to thin tubes, flitch plate attachments to tubular members, thin wiring plates, and a patented means of fastening.

NON-FERROUS ALLOYS

Non-Ferrous Metals for Aircraft, D. Hanson. "Aircraft Engineering," Vol. 2, Nos. 21 and 22. November and December, 1930, pp. 290-291 and 308-310, 2 figs., 8 tables.

THE properties of aluminum and magnesium alloys which are of value for aircraft requirements are analyzed. A discussion of specific tenacities, specific proof stresses, and specific modulus of some strong aircraft materials in general and the principal strong aluminum alloys, occupies the first article. In the second installment, detailed consideration is given to aluminum alloys in the cast and wrought condition, as well as cast and wrought magnesium alloys. Tables show approximate composition and properties of duralumin, copper-aluminum alloy, Y alloy, aluminum-silicon alloy, magnesium cast and wrought alloys, and cast and austenitic iron. Aircraft and engine designers in all countries are said to be very much alive to the possibilities of magnesium alloys, and experimental uses of this metal are referred to as well as its disadvantages. Satisfactory results obtained with Monel metal aircraft members without protective coatings are mentioned.

SUPERCHARGED ENGINE TESTS

Testing Supercharged Engines, J. Pettitt-Herriot. "Aircraft Engineering," Vol. 2, No. 22, December, 1930, pp. 300-304.

EQUIPMENT employed in making tests of supercharged engines is described with a discussion of methods found satisfactory in practice. Means of carrying out rating tests in order to establish the rated altitude, rated boost pressure, and rated ground-level power of the engine are taken up. Corrections are worked out for exhaust back pressure, compression ratio of supercharger blower, rated boost pressure, observed horsepower for rated boost pressure, horsepower at rated boost pressure to give ground-level power, ground-level power for effect of air-intake temperature at a certain altitude, correction of horsepower for difference in charge and exhaust pressure at that altitude, and rated full power. Endurance and final-power, power and throttle curves are explained. Auxiliary tests and altitude control are discussed.

AIRCRAFT SOUND LOCATOR

On the Acoustical Properties of Conical Horns, Sato-Kozi. Toki Imperial University, Aeronautical Research Institute. Report No. 64, Vol. 5, No. 11, November, 1930, pp. 261-285, 11 figs., 5 tables.

THE sound field due to a conical horn with a simple source at its vertex was calculated. In the case where the origin was taken at the vertex of the cone and the polar axis on its axis, an expression was given for the velocity potential at any point external to the horn. From this were calculated the energies at any point. The kinetic and potential energies have different values in general but at an infinite distance from the source, they become equal and are inversely proportional to the square of the distance as in the case of the spherical wave.

This theory started on the assumption that, on the spherical surface containing the opening of the conical horn, the motion of the air exists in its opening only. The next investigation aimed to compare the results of this theory with actual measurements. As a source of sound Edelmann's metallic pipe was blown under constant pressure with aid of carefully designed pneumatic tank. The distribution of intensity in different directions set at various pitches of sound produced by the pipe are illustrated. Results show the correctness of the theory and the applicability of the reciprocal theorem.

This is evidently a continuation of Reports Nos. 59 and 62 previously abstracted in AERO DIGEST.

MINIMUM VELOCITY AND AUTOROTATION

The Minimum Velocity of an Airplane and Loss of Velocity (La velocita minima dell 'aeroplano e la perdita di velocita), A. Eula, Rivista Aeronautica, Vol. 6, No. 11, November, 1930, pp. 237-280, 41 figs.

THE elements upon which the value of the minimum velocity of an airplane depends are defined, and a system for reducing the minimum velocity is indicated. The characteristics are described, and the cause of the so-called loss of velocity is determined. The limits to increasing the lift of the wing are discussed.

The author takes up the phenomenon of autorotation of the wing, the cellule, and the complete airplane, referring to tests of the British Bristol fighter and American VE-7 planes. He illustrates with diagrams the different types of spinning and demonstrates what may be the origin of spinning. He concludes that the centering of the plane and proportioning of the control surfaces should not be exclusively lower than the needs of the normal flight, but ought to insure a rapid and safe end to spinning either when it is caused by the pilot or when it is produced spontaneously. In a subsequent article the author proposes to describe the means and regulations which have been devised and applied to lower the minimum velocity and to eliminate the consequences of loss of velocity.

CANTILEVER WING DESIGN

The Torsional Static Stability of a Cantilever Wing with two Spars (Sulla stabilita statica torsionale dell 'ala a sbalzo a due longaroni), C. Minelli. "Notiziario Tecnica di Aeronautica," Vol. 6, No. 11, November, 1930, pp. 112-140, 3 figs.

THE author considers the general design of a two-spar cantilever airplane wing and takes up the case of pure torsion of a cantilever wing with two parallel spars with various refinements of rigidity and with ribs of definite number, provided with infinite rigidity to bending in its own plane and definite rigidity to torsion. For such a case and for such a structure, on the basis of the theorem of the work of deformation, the author derives the elasticity equations in which may be compared the linear dimensions, the bending and torsional rigidity of the various elements of the structure, the hyperstatic internal force, and the aerodynamic bending moments. Such equations permit the solution of the proposed hyperstatic problem in the first approximation.

Some hypotheses of elastic and aerodynamic characters are drawn up in order that for a given setting the aerodynamic bending moments may be expressed, by means of adimensional coefficients, in functions of the wind velocity and of the angle of elastic torsion. In this manner it is possible to place the elasticity equations under a form of successive approximations, in order to take into account the mutual influence between the torsional elastic deformations and the corresponding variations of distribution of the aerodynamic bending moment and permit the solution of the problem in this way, for a given initial setting and given velocity.

The theoretical critical velocity is derived for the torsional static stability of the structure. It is found that for the same velocity, the determined denominator of the internal hyperstatic force is zero, or that the internal force, and consequently, the deformations of the bending of the wing proper, are infinite. A short numerical application of the proposed method follows.

CRANKSHAFT TORSIONAL VIBRATION

Torsional Vibration of Crankshafts. The Beardmore Tornado Airship Engine Investigation, B. C. Carter, and N. S. Muir. Aeronautical Research Committee—Reports and Memoranda No. 1303 (E. 39), July, 1930, 56 pp., 31 figs.

FROM calculations made during the early stages of development of the Tornado engine for use in H.M. airship R 101, it was inferred that serious torsional vibration would be experienced in the region of 950 revolutions per minute, the proposed normal speed, unless important modifications were made to the design. Tests described in this report were made under a variety of conditions regarding the type of crankshaft, drive, and propeller fitted.

The torsional characteristics revealed by the toriograph accorded with those anticipated from theoretical considerations. The results of increasing the journal diameter from five to five and three-quarter inches was to raise the main synchronous speed from 930 to 1,000 revolutions per minute thus reasonably confirming the calculated increase of 75 revolutions per minute. No appreciable difference was detected between the variable pitch and adjustable pitch propellers. Stiffening the crankshaft by adopting the eight and one-half-inch wide webs had the effect of raising the main synchronous speed to 1,000 revolutions per minute when a wooden propeller was fitted with a fixed hub.

HEAVY OIL ENGINES

Performance of a Compression-Ignition Unit with Reduced Intake and Exhaust Pressures, P. H. Stokes. Aeronautical Research Committee—Reports and Memoranda No. 1328, (E. 38), December, 1929, 20 pp., 21 figs.

TESTS were carried out on the R.A.E. 20T compression-ignition unit to determine the rate of decrease in power with

(*Continued on following page*)

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(*Continued from preceding page*)

reduced intake and exhaust pressures, the rate of increase of power with boost and the change of power and thermal efficiency with change of excess air at reduced pressures.

The rate of decrease of fuel consumption with the increase in excess air coefficient was found to be more rapid at the lower absolute pressures. The amount of fuel injection advance necessary to maintain constant maximum cylinder pressure at reduced loads increased more rapidly as the air density decreased; thus an unsupercharged compression-ignition engine at altitude would require a wider range of fuel injection advance than was apparent from ground level conditions. The tests with varying excess air coefficient and constant fuel injection timing when compared with the preceding tests, demonstrated the advantages, especially in fuel economy, to be obtained by advancing the time of fuel injection. When increasing the intake pressure above that of the exhaust, the increase in power was 37 per cent for a 40 per cent increase in intake pressure, maintaining 30 per cent excess air.

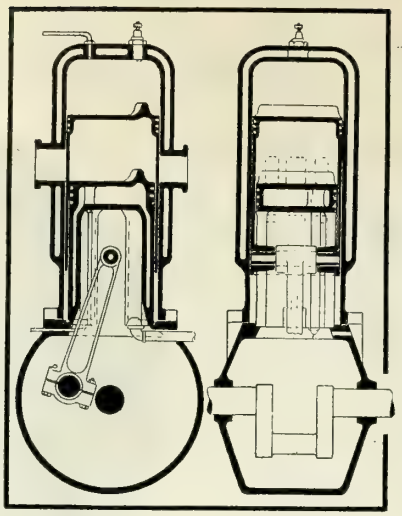
LONGITUDINAL STABILITY OF CANARD TYPE PLANE

The Static Longitudinal Stability of the Canard type Airplane (Die statische Langsstabilitat der Entenbauart). H. G. Kiel. "Zeitschrift fur Flugtechnik und Motoruftschiffahrt," Vol. 21, No. 23, Dec. 15, 1930, pp. 601-610, figs. 21.

THE airplane which is steered from the front, that is, the Canard type—shows a number of advantages over the normal plane and because it carries the elevators and fin in front, the total lift is greater than that of the normal plane of the same wing and control surfaces. In the investigation described, the downwash influences of the elevators and fin, situated in front of the wing, and the negligible influence of the center of gravity were neglected. Formulas were derived for the wing moments and the moments of the control surfaces in relation to the plane center of gravity, as well as its area, depth and angle of attack of the wing. It is necessary that the maximum upward lift of the control surfaces reach two degrees sooner than that of the wing.

It appeared that the static longitudinal stability of the Canard type of plane was in a great measure influenced by the choice of profile. If this type in normal cruising radius finds compensation and, in its whole angle of attack, stability, then there is always available a control surface in which the angle of attack between zero and the highest lift is greater than it is in the wings. For this type it is most advantageous to use a constant center of pressure profile for the wing and a more rounded one for the control surfaces. If a more rounded profile should be chosen for the wing, then the control surfaces should use a slotted profile. Examples of profiles of medium thickness and various rounded profiles suitable for this type of plane are given.

The Focke-Wulf-Ente is a good example of this type of plane.



Two-cycle double acting engine

HEAVY OIL AIRCRAFT ENGINE

A Two-Cycle Double Acting Engine (Motore a due tempi e doppio effetto), M. Behmann. Rivista "Aeronautica," Vol. 6, No. 11, November, 1930, pp. 281-291, 12 figs.

A TWO-CYCLE double-acting engine is described which allows a remarkable reduction of weight especially when applied to heavy-oil engines, making them practical for aircraft and vehicles. In an ordinary cylinder of a two-cycle engine there is arranged a movable hollow piston within which is a fixed piston, the area of the cylinder within the movable piston being varied by the motion of the movable piston, giving the effect of two independent cylinders in each of which the normal two cycles operate.

The cylinder has two openings one for exhaust and one for intake of the charge, which are covered and uncovered by the movable piston in its stroke in the cylinder. Openings in the sides of the piston coincide with the cylinder openings at certain points in the stroke, so that the cylinder within the movable piston may receive the charge or exhaust the bases at the proper point in the cycle. Arrangements for both fuel injection and spark ignition are demonstrated.

NOISE ELIMINATION IN AIRPLANES

The Causes of Noise in Aircraft, A. H. Davis. "Aircraft Engineering," Vol. 2, No. 21, pp. 273-274.

THE principal sources of sound are analyzed with suggested remedies, these sources including exhaust from the engine, clatter of the engine itself, the airscrew, and the vibration communicated to the panels of the cabin structure by vibrations set up by the engine or, to a lesser extent, by the vibrating stay wires. Since the airscrew is the most important single source of noise with present practice, it should not be placed at the side of the cabin, and passengers especially not situated in the plane of its rotation. The possibility that water-cooled engines may be more silent is referred to.

The author suggests that exhausts should be situated above the wing or in some similar position so that they are screened from direct transmission of sound to the cabin.

HEAVY-OIL ENGINES

The Clerget 100-Horsepower Heavy-Oil Engine (Le moteur Clerget 100-hp. a huile lourde). "Aeronautique," Vol. 12, No. 138, November, 1930, pp. 391-396, 16 figs.

ALTHOUGH the Clerget heavy-oil engine for aircraft has often been described, this article is by far the most instructive, for it gives complete details of the design of the various parts and explains their operation with mechanism drawings. The engine is a nine-cylinder, four-cycle radial air-cooled engine with a bore and stroke of 120 and 130 millimeters, respectively, developing 100 horsepower at 1,800 revolutions per minute, and weighing 228 kilograms. Gas oil, such as used on stationary engines, is employed which has a density of 0.86 and a calorific value of 9,500 calories.

ECONOMICS OF AIRPLANE CONSTRUCTION

Concerning the Economics of the Different Construction Methods Employed for Building Airplanes (Uber die Wirtschaftlichkeit in der Fertigung der verschiedenen Bauverfahren von Flugzeugen), H. Herrmann. "Zeitschrift für Flugtechnik und Motorluftschiffahrt," Vol. 21, No. 21, Nov. 14, 1930, pp. 553-563, 10 figs.

THE financial character of each type of material used and the different construction elements are examined, and their influence on the finished construction work is fixed. Such parts as the wing frame, fittings, spars, ribs, struts, floats, rudders, fins, and fuselages of plywood, steel tube and duralumin are discussed. The monoplane, compared with the biplane of the same construction, is shown to be cheaper. Construction entirely of metal proves much dearer than the so-called mixed construction.

Curves given include the prices of different materials, such as duralumin, Elektron, aluminum, sheet steel and plywood; the prices of different sheet metals, such as Elektron, duralumin, brass, and steel, as well as plywood and fabric; the prices of tubes and profiled sections of duralumin, aluminum, steel and copper.

A description of construction methods on the engines and undercarriages of airplanes is followed by a discussion of the influence of airplane size upon the cost of constructing wings, fins, rudders, fuselages, engines, landing gear and floats. It is shown that the development of airplane construction has been towards cheaper methods. The increased sizes are cheaper especially when in the single-motored class. The smaller the airplane, the dearer it is with respect to unit lifting surfaces. rudder, fin, and fuselage. It is concluded that the production of very small and very light airplanes will not continue.

Decentralization of powerplants, that is the use of several separate units instead of one, is said not only to limit the flying efficiency and pay load but to increase the cost of installation at an alarming rate. The author suggests, therefore, that the size of motors be increased and in very large planes three or four large motors be employed instead of ten or twelve.

TEXACO MARFAK GREASE ENDURINGLY EFFECTIVE

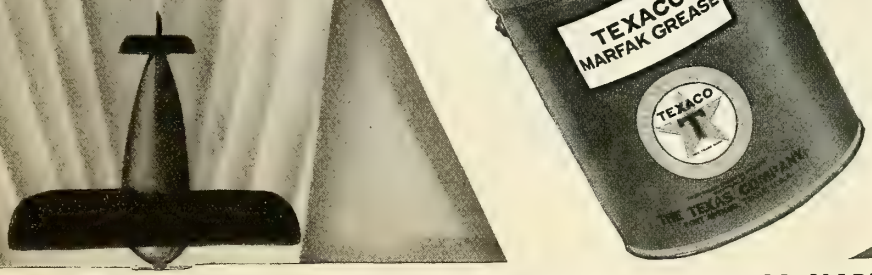
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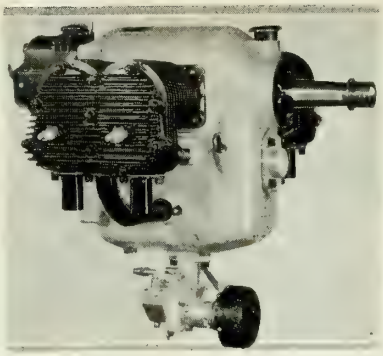
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CONTINENTAL A40 ENGINE

ANNOUNCEMENT has been made by the Continental Aircraft Engine Company of Detroit that its new Model A40 light airplane engine is now in production. The Continental Model A40 engine is a four-cylinder, L-head, four-cycle design of the horizontally opposed type. The engine has 3 1/8-inch bore and 3 3/4-inch stroke, which gives a piston displacement of 115 cubic inches. It develops 35 horsepower at 2,500 revolutions per minute and 38 horsepower at 2,800 revolutions per minute. The engine is air-cooled and weighs 138 pounds with magneto and carburetor.



The cylinders are cast in pairs of nickel iron. Cooling fins are cast on the cylinders. Provision is made for circulation of air around each barrel. The bores are ground to a mirror finish and held to close limits. Each cylinder block is attached to the crankcase by six studs and nuts.

The cylinder heads are cast in pairs of heat-treated aluminum alloy. Adequate fins for heat dissipation are cast on the heads, and bronze spark plug inserts are cast in place. The cylinder heads are removable and attached to the cylinder blocks with studs and nuts. Steelbestos gaskets are used between head and block.

Trunk type pistons are made from heat-treated, permanent-mold aluminum alloy castings. The heads are thick to dissipate heat, and the skirts are extra long to eliminate scuffing. Three compression rings and one oil control ring are above the piston pin boss. Piston pins are secured by snap rings.

The crankcase is a one-piece, heat-treated aluminum alloy casting heavily ribbed within for strength, and presenting a smooth exterior which conforms very well to the airplane's nose cowling. The case contains crankshaft and camshaft bearings, and carries the valve tappets in reamed bosses. An oil reservoir is provided in the base of the crankcase. This reservoir is divided from the upper portion by wide webs between the tappet bosses which extend toward the center a considerable distance from each side wall, and between them is inserted an oil screen which runs the length of the case. An oil filler and breather is provided on the forward part of the case, while on the rear face are cast four supporting lugs.

A crankcase cover of heat-treated aluminum alloy is attached to the rear of the crankcase and carries the flange mounted magneto which is driven from the rear of the crankshaft. The crankshaft rear bearing support is also bolted to the crankcase cover. On the lower part of the cover is the tachometer connection.

The crankshaft is a one-piece, three-throw high carbon steel forging. It is heat-treated and completely machined. Counterweights are forged integral with the crankshaft. The shaft is drilled throughout for lightness and plugged to provide an oil passage. It is supported by two bronze-backed, babbitt-lined bearings which are align-reamed in place. Thrust is taken in either direction to provide for tractor and pusher installations. The crankshaft is machined with an S. A. E. taper end for propeller hub, which is furnished with the engine. The rotation of the crankshaft is anti-clockwise when viewed from the propeller end.

The camshaft is a heat-treated carbon steel forging drilled throughout for lightness and to provide an oil passage. Individual cam lobes and bearing journals are case hardened and ground. A drive is provided at the rear end for tachometer. The forward end is slotted to operate the oil pump blade.

The connecting rods are made from heat-treated carbon steel one-piece forgings. The caps are severed from the rods and babbitt crankpin bearings are permanently spun in after the caps have been bolted to the rods. Bronze piston pin bushings are pressed into bosses and are reamed in place.

Chrome nickel, tungsten steel valves are operated by long, round-nose steel tappets. Valve adjustment is provided by screws and lock nuts.

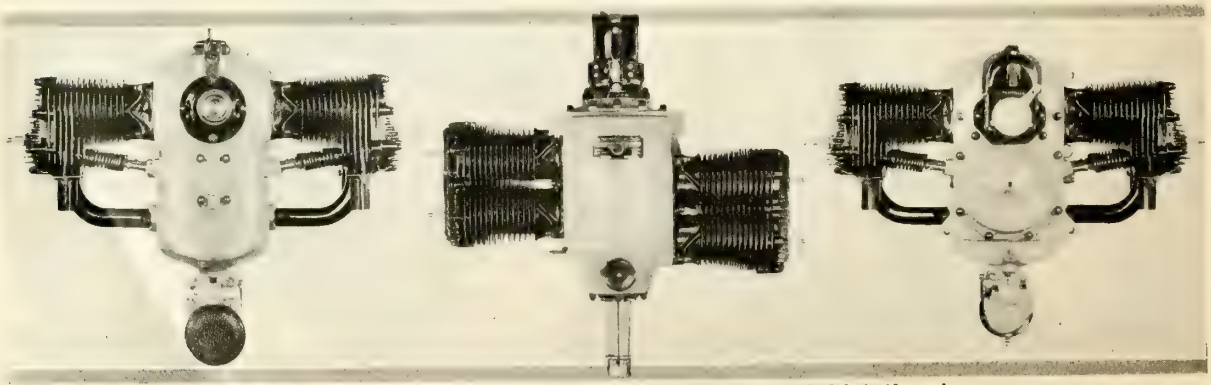
Fuel mixture is provided by a single carburetor attached to the bottom of the crankcase. The riser from the carburetor passes upward inside the case, where it branches right and left and connects with the cylinder blocks by means of intake pipes. The oil serves to heat the intake charge, and the cold mixture cools the oil.

Full pressure lubrication is supplied to main bearings, crankpin bearings and camshaft bearings. An automatically primed blade type oil pump is operated by the camshaft, and oil is forced through drilled passages in crankcase, crankshaft and camshaft to the various bearings. Intake of pump is through a drilled boss extending to the bottom of the oil reservoir. Cylinder walls and piston pin bearings are lubricated by oil spray. No internal or external oil tubes are used in the engine. The oil reservoir holds three quarts of lubricant, which is measured by a bayonet oil gauge toward the front of the case. A deep annular groove in the rear camshaft journal, provided with a drilled hole into the camshaft oil passage, registers with an opening in the crankcase where the pressure relief valve is located. Oil pressure is maintained at approximately 35 pounds at 2,500 revolutions per minute.

Ignition is provided by a single magneto driven directly from the crankshaft. A tachometer drive is provided.

Specifications

Bore	3 1/8 inches (79.4 mm.)
Stroke	3 3/4 inches (95.2 mm.)
Piston displacement per cyl.	28.7 cubic in.
Total piston displacement	114.8 cubic in.
Power	35 h.p. at 2,500 r.p.m.
	38 h.p. at 2,800 r.p.m.
Dry weight	135 pounds



Front, top and rear views of the 38-horsepower Continental Model A 40 engine

SHIPS THAT FIT EVERY FLIER'S NEED



PRICED TO PLEASE ALL-COMERS TO THE SKIES

CURTISS-WRIGHT will present a fleet of seven ships for 1931 that will perform feats of endurance, economy and handling ease that set up new standards of simplicity and service. ● Trim refinements, abundant power give the new Curtiss-Wright runabouts announced here . . . and the other ships to be announced soon . . . a measure of performance and rugged strength that will please owners of 1931! ● Here is your opportunity to get your share of the business now and in the years ahead. Striking simplicity of control and of service makes it possible for anyone to own or pilot a Curtiss-Wright plane. Wide variety of the well-balanced fleet gives dominance to the dealers of Curtiss-Wright in every field of flying. ● For here are seven outstanding new ships. They're priced to please all types of buyers. They're designed to suit every kind of need. They're produced by the oldest and best-known manufacturer. And they're distributed by the best dealer organization. ● To the public Curtiss-Wright means dependable flying. To pilots it means stamina and service. To the distributor, building good business now and for the future, Curtiss-Wright is a name he can depend on . . . a name to help him grow!

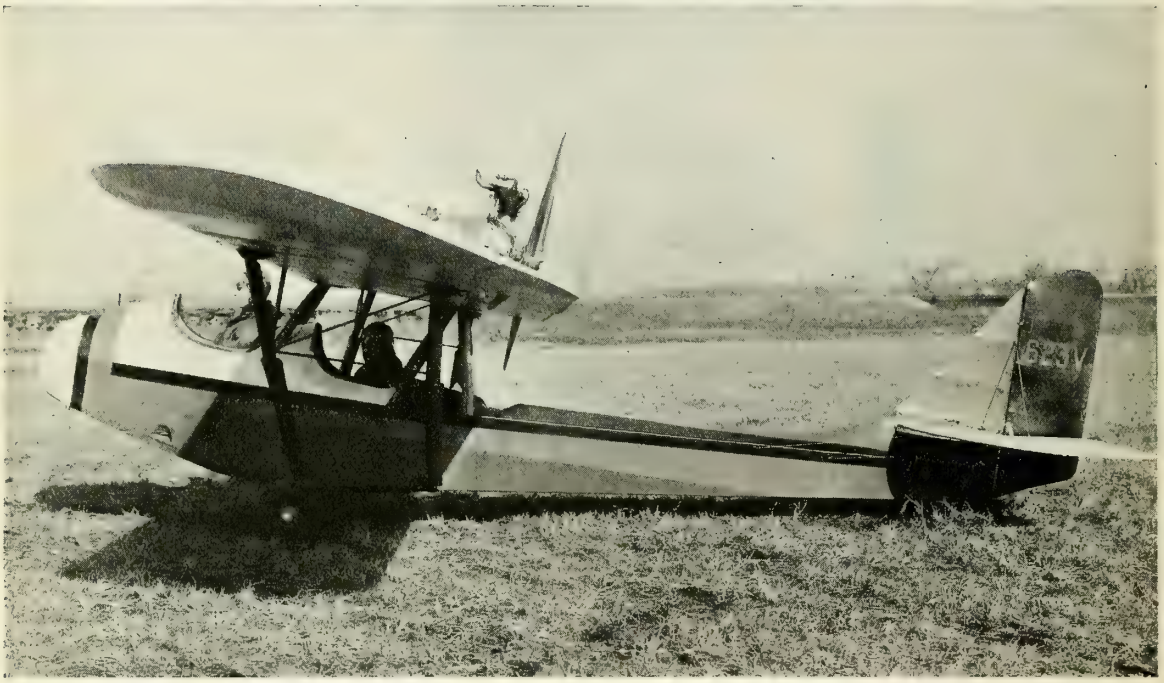


CURTISS-WRIGHT

AIRPLANE COMPANY

ROBERTSON, MISSOURI

NOT ONLY A NEW PLANE BUT A NEW KIND OF PLANE!



THE CURTISS-WRIGHT "JUNIOR"

THOSE who are flying ships two years old have no idea what keen work has gone on behind the scenes in research and engineering. ● As you look over these advance models of Curtiss-Wright's new fleet you cannot fail to be impressed with the striking strides of Curtiss-Wright production. ● But of all the fleet, the ship that will supply the most news for 1931 is the Curtiss-Wright "Junior"—a 2-place plane specially designed for amateurs! ● Engineered by the staff that designed fighters for the Army, the Navy, and record-smashing sport and commercial planes, the "Junior" benefits by all that Curtiss-Wright has learned in building for the whole field. ● First, imagine a ship that costs $1490 . . . one that takes off from a good-sized lawn, lands in the same space, and is so easy to fly that beginners have mastered it in a day! ● Imagine a plane that hits 80, cruises at 70 . . . gets 26 miles to a gallon of gas . . . yet lands at 28 m. p. h. in 150 feet! For that's what the "Junior" will do! Easy to buy, easy to fly...and so refined in design that an amateur could assemble it. ● Instruments complete even to a Beech-type speed indicator and perfect visibility makes it the easiest type to fly or to learn to fly. Such refinements are possible only when an organization designs its products to cover the entire field.

STABLE FOR SPORT
STURDY FOR TRAINING

THE TRAVEL AIR
"SPORT-TRAINER"



WHAT Curtiss-Wright learned from the "Mystery Ship," fastest commercial plane in the world, Curtiss-Wright now incorporates in the striking new TRAVEL AIR Sport-Trainer. ● Sturdily built, trimly refined, you'll like this fleet little ship. It offers advances in stability, handling and servicing ease, which can be affected only when an organization builds for the whole field. ● Its clean-cut lines, its sleek streamlining, its speed in excess of 100 m. p. h. and cruising range of 500 miles, make it a craft of which you may be justly proud. ● Actually it's so stable in flight and so responsive to all controls that it's a real treat to fly it! ● Powered with the air-cooled Wright-Gipsy engine, with a full complement of quality instruments, with a special wide-tread, shock-absorbing landing gear and brakes, this TRAVEL AIR is remarkably easy to control on the ground or in the air. In every detail it is designed to make flying and servicing by the owner as inexpensive as possible. ● That's why the Sport-Trainer will make a wide appeal to 1931 buyers!

CURTISS-WRIGHT
AIRPLANE COMPANY
ROBERTSON, MISSOURI

Amended Airworthiness Requirements

Effective January 1.

FINAL revision of the Airworthiness Requirements of Air Commerce regulations has been effected, after consideration of the recommendations made at the conference of the Aeronautics Branch and the manufacturers September 26, and the amended requirements became effective on January 1, in accordance with an arrangement previously decided upon.

These amended requirements are being published as a revision of Aeronautics Bulletin 7A, Airworthiness Requirements of Air Commerce Regulations. Until copies of this new bulletin become available, the effective Airworthiness Requirements will consist of the present printed requirements as modified by the proposed amendments to Airworthiness Requirements of Air Commerce Regulations (printed in the AIR COMMERCE BULLETIN on pages 147 to 152, Vol. 2, No. 6) and as further modified by a memorandum to manufacturers dated December 4, which is printed herewith.

Definition of small aircraft.—Small aircraft falling within certain limitations will be defined as "light airplanes."

Limiting specifications for light airplanes.—Light airplanes, when equipped with engines not of an approved type, are defined as heavier-than-air aircraft of less than 1,000 pounds gross weight, with a maximum wing loading of 5.5 pounds per square foot, and having at least five square feet of wing area per engine horsepower. When equipped with engines of an approved type, airplanes of less than 1,000 pounds gross weight may be classed as light airplanes if the wing loading does not exceed six pounds per square foot and the ratio of wing area to horsepower is not less than four.

Tests of Equipment

Landing gear drop tests.—When, in the opinion of the Secretary of Commerce, the design of the landing gear is such as to warrant, a drop test will be required. When such a test is required the test shall be made with the landing gear attached to the actual airplane structure, unless it is obvious that the result to be ascertained can be determined by the use of an approved jig in place of the actual airplane structure.

Overload on special static tests.—This regulation will stand as written in the proposed amendments dated July 21, except that the following paragraph will be added:

In the case of structures which successfully withstand 150 per cent of the design load without failure, the auxiliary specimen tests may be waived, provided the manufacturer submits, with affidavit, a satisfactory statement of the materials involved and the guaranteed maximum range of variation of their physical properties.

Static tests in lieu of analysis.—The regulations on this subject will remain as written in the present edition of Bulletin 7-A.

Cleaning windows for forward vision.—In cabin aircraft the windows shall be so arranged that they may be cleaned or opened in flight to provide forward vision for the pilot.

Minimum headroom. — The requirement relating to minimum head room will be deleted.

Fuel dump valves.—This requirement will remain approximately as written in the proposed amendments, except that the word "released" will be substituted for the word "controlled."

Fuel gauges.—All airplanes shall have installed a satisfactory gauge for indicating to the pilot or other member of the crew the quantity of fuel in each tank while in flight.

Fire Protection

Protection behind engine cowl openings.—Openings in the engine cowl at or near the fire wall will be permitted provided that metal, or other suitable fireproofing material, is used to protect the airplane surface over a radius of 15 inches from any such opening.

Expansion space in oil tanks.—This regulation will remain as written in the proposed amendments dated July 21.

Clearance for electric wires.—The existing minimum clearance requirements between low-tension electric wiring and gas and oil pipes will be eliminated.

Portable fire extinguishers. — When portable extinguishers are used they shall have a minimum capacity of one quart except that one pint extinguishers may be used in light airplanes.

Performance. — The regulations concerning quantitative performance requirements will stand as written in the proposed amendments dated July 21, except for the following modifications:

Airplanes which are not designed or used to carry passengers may have a maximum landing speed of 70 miles per hour with full useful load.

Single-engine airplanes other than those mentioned above may have a maximum landing speed of 65 miles per hour with full useful load.

The minimum climb at sea level for landplanes will be 400 feet per minute.

The minimum climb at sea level for seaplanes will be 350 feet per minute.

Stability of Aircraft

Stability.—Under all load and power conditions, all airplanes shall be longitudinally, laterally and directionally stable.

At engine speeds between the minimum required for level flight and 90 per cent of the rated engine speed all airplanes shall be longitudinally balanced and stable in level flight. All airplanes shall preferably be longitudinally balanced and stable in level flight at full power, but will be acceptable if, with the stabilizer set for balance in level flight at 90 per cent rated engine speed, they assume a stable climb at engine speeds above 90 per cent and will not stall nor fall out of control from that position. With power off all airplanes shall be longitudinally balanced and stable at some speed between 130 and 140 per cent of the stalling speed at sea level altitude. All the above conditions shall apply to all load conditions.

Spinning.—The regulations governing spin tests will remain in force substantially as they are now written.

Bungee devices in control systems.—The use of bungee devices to improve longitudinal control will be permitted within the following limitations:

(1) Airplanes of less than 2,500 pounds gross weight shall be balanced and stable in any one load and power condition without the aid of the bungee.

(2) Airplanes of more than 2,500 pounds gross weight shall comply with all of the required flight characteristics without the aid of the bungee.

(3) In all cases the airplane shall be satisfactorily maneuverable and controllable under all conditions without assistance from the bungee device and in all cases the bungee mechanism shall be of a type and design satisfactory to the Secretary of Commerce. Rubber cord shall not be used for this purpose.

Craft Eligible for Placarding

Weight placard.—The regulation stating the minimum gross weight below which airplanes will not be eligible for a variable weight placard has been revised to read as follows:

The approved gross weight shall be 3,500 pounds or more, or in the case of airplanes weighing less than 3,500 pounds, the actual empty weight shall not exceed the empty weight assumed and substantiated in the stress analysis submitted to the Secretary of Commerce.

Minimum payload.—There will be no minimum limit concerning the payload to be carried in any airplane.

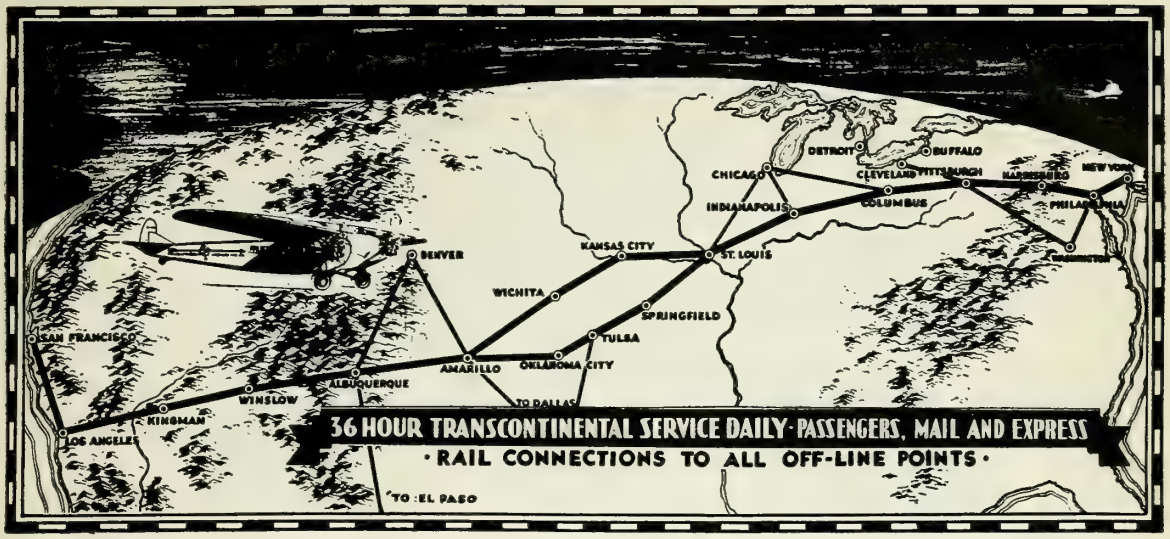
Seaplane flying load factors.—These factors will remain as written in the proposed amendments dated July 21.

Tail surface loads.—The average unit loads for the design of horizontal tail surfaces shall be obtained by interpolation between the values given in Figure 1.

Ailerons and vertical tail surfaces shall be designed to support average unit loads equal to 75 per cent of those required for horizontal tail surfaces.

The distribution of this load over the surfaces shall be in accordance with the present requirements as outlined in Bulletin 7A.

(Continued on following page)



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(*Continued from preceding page*)

Landing load factors. — The landing load factors for landplanes will remain as written in the present regulations, except for gross weights of less than 1,000 pounds. For airplanes of gross weight less than 1,000 pounds the landplane landing load factor shall be dependent upon the wing loading, and shall vary as a straight line from five when the wing loading is three pounds per square foot to 6.5 when the wing loading is 10 pounds per square foot.

Design of Control Systems

Control system loads.—Control systems shall be capable of carrying loads corresponding to 125 per cent of the design loads specified for control surfaces except that, when the resulting load on control column or rudder pedal is less than the minimum noted below, the latter value shall be used. If the necessary force on the control column or rudder pedal exceeds the maximum noted below, the latter may be used.

(*A*) For elevator loads a maximum of 300 pounds applied at the grip on a control stick, or forces of half this value applied at two diametrically opposite points on the rim of a control wheel and acting in a fore-and-aft direction. The minimum force shall be applied in the same manner and shall vary in magnitude according to the gross weight of the airplane as follows:

(1) Two hundred pounds for airplanes of 1,500 pounds gross weight or more.

(2) One hundred pounds for airplanes of 500 pounds gross weight or less.

(3) For airplanes of gross weight between 500 pounds and 1,500 pounds the minimum force shall vary as a straight line between 100 pounds and 200 pounds.

(*B*) For aileron system loads the maximum value shall be 125 pounds applied at the grip of a control stick, or a couple equal to the product of the diameter of a control wheel and a force of 125 pounds. The minimum force which shall be applied in the same manner shall vary with the gross weight of the airplane as follows:

(1) Seventy-five pounds or equivalent couple on airplanes of 1,500 pounds gross weight or more.

(2) Thirty-five pounds or equivalent couple on airplanes of 500 pounds gross weight or less.

(3) For airplanes of gross weight between 500 pounds and 1,500 pounds the minimum force shall vary as a straight line between 35 pounds and 75 pounds.

(C) For rudder loads on all airplanes a minimum force of 200 pounds and a maximum force of 300 pounds applied at point of contact of pilot's foot.

Load Factors for Seaplanes

Seaplane side landing.—This regulation will stand as written in Bulletin 7-A, except that the load factor eight will be reduced to six, and the load factor two will be reduced to 1.5.

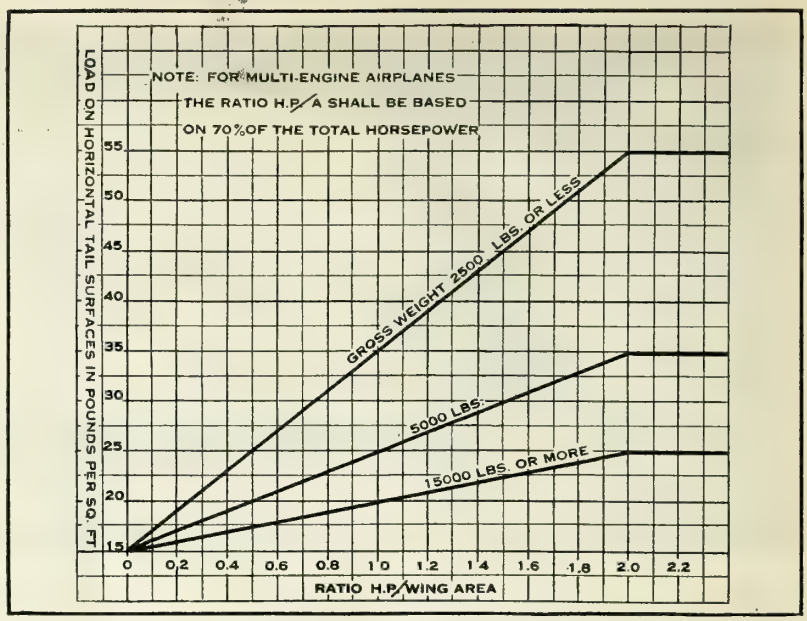


Figure 1, showing average unit loads for the design of horizontal tail surfaces

Up load on tail surfaces.—The design load acting upward on horizontal stabilizers will be specified as equal to one-half of the required down load. The design load on elevators shall be assumed to act in either direction.

Wing-rib tests.—When tested, the ribs shall be attached to sections of spars by the same method as is used in the actual airplane except that all gluing in these joints shall be omitted.

To simulate the lateral bracing effect of lacing on fabric-covered wings, the ribs, when tested, may be supported laterally by guide blocks. These guide blocks shall leave the rib free to deflect in the direction in which the load is being applied, shall have faces bearing against the rib which are not wider than one-half inch, and shall be spaced at least eight inches apart.

Ribs which are attached to plywood, metal or other similar wing covering in the airplane structure may be tested with a section of the covering attached, provided that the section used during the test is not wider than the rib spacing in the airplane, and that the covering is attached to the rib during the test in exactly the same manner as is used in the airplane. No less than two ribs shall be tested in either loading condition, and the lowest total loading which causes failure shall be used as the criterion for judging the ribs.

Bolt holes in spars.—In computing the area, moment of inertia, etc., of wood spars pierced by bolts the diameter of the bolt hole shall be assumed to be 25 per cent greater than the diameter of the bolt, except that the assumed diameter of the hole need not be more than one-eighth inch in excess of the bolt diameter.

Formula for Wing Ribs

Wing-rib spacing. — The maximum spacing between wing ribs outside of the propeller slipstream on fabric-covered wings shall be determined by the following formula, except that this spacing shall not in any case exceed 18 inches.

$$b = 7 + \frac{(130)\ (\ c\ )^2}{(\ h\ )\ (\ v\ )}$$

where

b=space between ribs in inches.
h=maximum depth of rib in inches.
c=chord length of rib in inches.
v=maximum speed of airplane in miles per hour.

The maximum spacing within the propeller slip stream shall be 70 per cent of that which would otherwise be required. Usually at least one intermediate rib will be required in the nose portion of the wing to keep the leading surface free from major irregularities.

Buoyancy of boat hulls and floats.—Each main seaplane float shall contain at least five water-tight compartments of approximately equal volume on airplanes of more than 2,500 pounds gross weight and shall contain four such compartments on airplanes of less than 2,500 pounds gross weight.

The hulls of flying boats and amphibions shall be divided into water-tight compartments so arranged that, with any two compartments flooded, the hull will retain sufficient buoyancy to support the gross weight of the airplane in fresh water. The bulkheads, however, may have water-tight doors for purposes of communication between compartments.

Wing-tip floats.—Wing-tip floats shall be so arranged that, when completely submerged in fresh water, they will provide a righting moment which is at least 1.5 times the upsetting moment caused by the airplane being tilted.

(*Continued on following page*)



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(*Continued from preceding page*)

Stabilizer stops.—When an adjustable stabilizer is used, stops shall be provided at the stabilizer to limit its travel to the range required to balance the airplane, or to the range for which it is designed if the design range is not excessively larger than is required to balance the airplane.

Splicing of Cables

Cable terminals.—When 7-by-19 extra flexible aircraft cable is used in control systems, a standard tuck splice, such as is approved by the Army or Navy shall be used. Non-flexible nine-strand cable may be used for straight leads, in which case the Army or Navy standard wrapped and soldered splice may be used.

Brazing.—Flame brazing or partial dip brazing may be used to attach pin plates to fitting lugs on which subsequent welding is not done, provided that the facilities, materials and processes are satisfactory to the Secretary of Commerce and that the total thickness of material thus attached does not exceed the thickness of the base plate of the fitting. Such brazing shall not be practiced on any other assemblies which constitute parts of the primary structure.

Control wheel travel.—The specifications for range of fore-and-aft travel of the control wheel will be deleted. The specifications as to rearmost position of the wheel will, however, be retained as written in the present regulations.

Ballast Used During Flight Tests

Ballast.—The use of ballast to enable certain airplanes to comply with the flight test requirements as to longitudinal stability and balance in the lightload power-off conditions will be permitted with the following provisions:

(1) Ballast may be used for this purpose only in aircraft weighing in excess of 10,000 pounds gross. The operators of smaller airplanes may, of course, utilize as much ballast as they desire to assist in longitudinal control while flying light. For the purpose of granting the original approval to such smaller aircraft, however, is is necessary that they meet the minimum stability without ballast.

(2) All airplanes shall be so arranged that they can be safely landed without ballast.

(3) In airplanes for which ballast is utilized a placard shall be placed, at some point within full view of the pilot, stating the minimum weight of ballast which should be carried when the airplane is flown without payload, and the place where the ballast must be located.

(4) All airplanes shall be balanced and stable longitudinally with 10 per cent of their authorized payload without the aid of ballast.

(5) The place for carrying ballast shall be properly provided and plainly marked.

(6) If the space provided for carrying ballast is in some place other than one in which normally an equal amount of payload would be carried, due allowance for the ballast weight shall be made in the design of the airplane structure.

BUHL "BULL PUP"

THE Buhl "Bull Pup" is a single-place monoplane designed by Etienne Dormoy, chief engineer of the Buhl Aircraft with a three-cylinder Szekely engine of 45-horsepower but is designed to accommodate several types of engines ranging from 40 to 80 horsepower.

Powered with the Szekely engine, the Bull Pup has a high speed of 92 miles per hour and a landing speed of 35 miles per hour. However, the ship will be produced in quantity production with various sizes of wing span available; larger wing span for slower landing speed and smaller wing span for those requiring speed. Several models differing in wing span will be manufactured.

The wings are of conventional wood construction, fabric covered. Wing fittings and wire pulls are installed inside the wings. The fuselage is monocoque in design and is built of duralumin. Oleo type landing gear utilizing oil to minimize landing shocks and shock cord for taxying is provided. The fin is built of duralumin and is an integral part of the fuselage. The other tail surfaces are of steel tubing and are fabric covered.

The safety factor of the Buhl Bull Pup is 7.25.

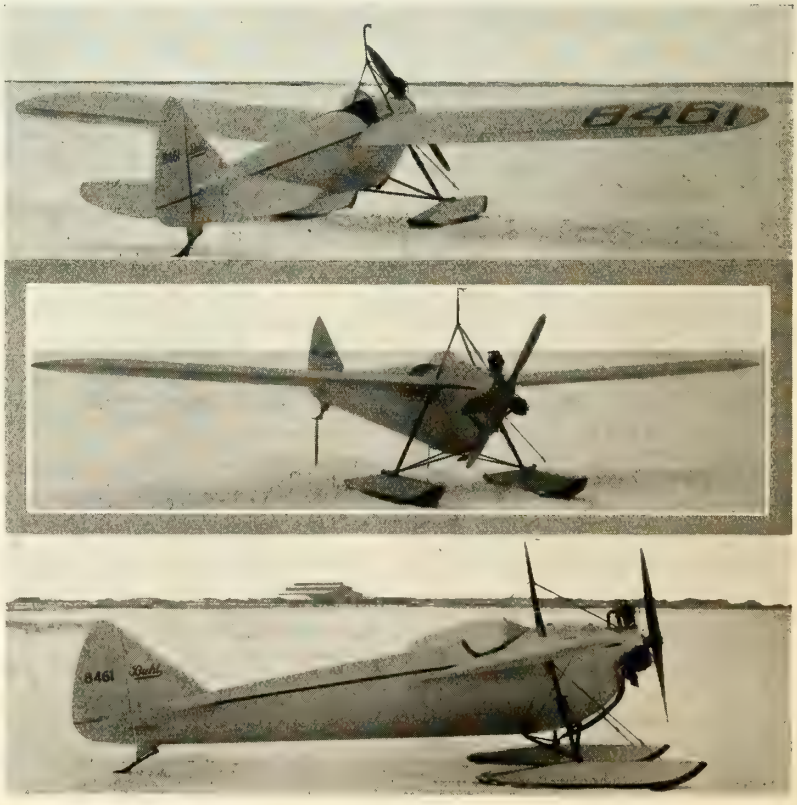
NEW POWER-DRIVEN EXHAUST SILENCER

A POWER DRIVEN exhaust silencer, which the inventor claims will decrease engine noise and increase the power of the engine, has been patented by Howard B. Jacobs of Independence, Missouri.

The device is driven from the engine in the same manner as a super-charger and operates by creating a vacuum on the exhaust pipes and on the compression chamber of the engine when the exhaust valve is open. This vacuum lowers the engine temperature from thirty to fifty per cent, thereby permitting a greater charge of gas in the engine without detonation. A resultant increase in power of 25 per cent is claimed.

The silencer was tested on a Wright J-5 engine. With the exception of the air stream passing out of the exhaust, the engine ran noiselessly and the engine speed with a set throttle was increased from 1,625 to 2,250 revolutions per minute.

The silencer tested was a root positive type blower driven three and one-half times the engine speed, creating about sixteen inches of vacuum on the exhaust system. The exhaust pipe ahead of the silencer was flared to create a large vacuum chamber, which caused the vacuum to remain stationary.



Views of the new Buhl "Bull Pup" single-seater powered with a Szekely engine

PERSONAIRLITIES

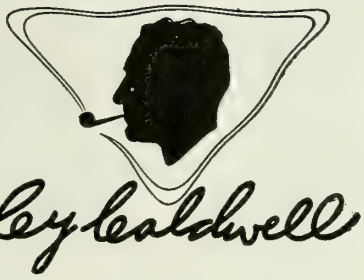
THE biographical notes appearing in this department of AERO DIGEST at this time are about pilots who are members of the National Air Pilots' Association, a most worth-while organization of pilots who are banded together to advance the cause of commercial aviation and to provide closer relationship among pilots, better to enable them to advance any movement that may be for their benefit as a class.

Pilots holding a license issued by the Department of Commerce and those having a military rating—Reserve officers or National Guard—are eligible for membership. If *you* are eligible, I hope that you will join us. We would like very much to have you with us. We're not exclusive; we're not high-hat. We're simply pilots; and if you are a licensed pilot, we invite you to join us. Our executive secretary, Carl F. Egge, 1364 Blount Street, Cleveland, will be delighted to have you write him about membership; and every one of the rest of us will give you a warm welcome to our great fraternity—what Amos 'n' Andy might call De Mystified Knights of De Air. Will you write Carl today?



ANYONE who has noticed the growth of the tabloid newspapers must have remarked the prominent part played by legs—or limbs, as we used to say in the Shy Era before the war. People reading the tabloids will gradually gain the impression that the human body is, say, seventy-six per cent legs and twenty-four per cent sex appeal—leaving nothing over for anything else. Faulty though this impression may be, nevertheless it has built up the circulation of the tabloids by the simple expedient of raising the circulation of the reader.

My own failure as a journalist—for no writer with only six readers can by any stretch of the imagination be considered successful—my own failure I attribute mainly to the lack of sex interest in my stuff. As a vest pocket biographer I am probably all right; as a commentator on the changing scenes in aviation I possibly pass muster; but as a purveyor of heart interest I am a washout. And I shouldn't be, either. By temperament I am warm, affectionate, even clinging. I know I don't look it, but I am. If you could see me affectionately wrapping myself about a large steak, for instance, or cuddling up to the Christmas turkey, you would say that here was a man of a warm, consuming desire. Yet none of



it appears in my writing; hence my host of readers remains constant at six—a mere ghost of a host.

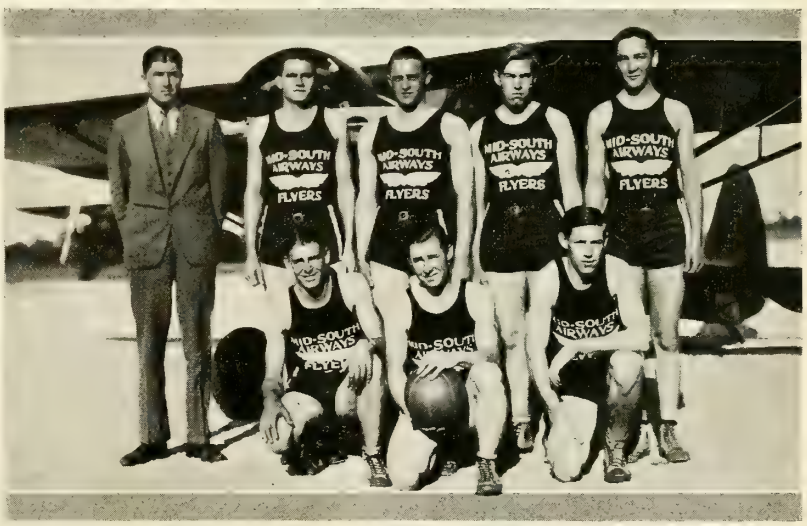
In a frantic effort to inject some sex interest into these drab pages, so I won't fall too far behind the tabloids, I publish herewith a picture that should do much to help the sale of airplanes to women. The automobile business, I would remind you, amounted to practically nothing until women had been sold the idea of making their husbands trade in last year's model so the dear friend next door would experience pangs of jealousy and the heeby jeebies. Aviation must sell itself to the women—and what better argument could be used than this picture of the kind of gladiators we pilots really are when we doff our flying togs

In this picture of the Mid-South Airways Basketball Team, of Memphis, Tennessee, you ladies are afforded a glimpse of us pilots in all our intriguing seductiveness. Reading from left to right, standing, we are Vernon Omlie (coach), Robert Ingram, Elmer Ricketts, Ralph Vestal, and Oliver Huff. Kneeling, we are Roger Coltharp, Kenneth Starnes, and Enoch Kulp. The ladies would probably pick out Elmer, third from left, standing, and Roger, first left, kneeling, and let the rest of the flock go by. I'm sorry I'm not in this line-up myself, to afford you girls a wider selection in shapes—and wider shapes, incidentally. But no matter—it is impossible to get all the physically perfect specimens in America grouped in one photograph. You'll have to imagine me hiding behind Phoebe Omlie's Monocoupe, *Miss Memphis,* winner of the Dixie Derby—I'm crouched down behind the tail skid, because I can't overcome my shyness of cameramen.

Phoebe sent me the picture, and wrote, "Yes, the Omlies from Memphis are back in the old Mid-South Airways and enjoying a business that doesn't seem to have been hit by the depression. I am enclosing a picture of the basketball team, made up of some of our students and boys who work on the airport. So far we have played two games and won both of them. Really, this has helped to stimulate aviation among the boys of this age, and a wonderful feeling among all classes who are interested in sports. We expect to come through the season ON TOP."

This is a mighty fine idea, Phoebe, and I congratulate you and Vernon. Let's put some interesting athletic trimmings into flying schools and airports all over the country. The old idea of loafing in a corner of the hangar, or lounging outside, or doing indoor aviating, is out of date. Why don't you

(*Continued on next page*)



The Mid-South Airways basketball team poses to add sex interest to PersonAIRlities

(PersonAIRlities continued)

young fellows get together at all the airports and go in for sports of all sorts? It will not only do you good physically—it will stimulate interest in aviation among the citizens of your community. You've lots of room on an airport—unless you're at the Tom Thumb Airport at Washington, D. C., known otherwise as Hoover Field.

By the way, why not a miniature golf course on every airport? It may be a passing fad, but it's good fun while it continues to interest. And a baseball diamond—why not? Do something to arouse more interest, or we may have to give *some* of these airports back to the farmers. And the farmers have enough worries now without having to face the problem of trying to raise potatoes on concrete runways.



Harold A. Elliott

IF you ask the man on the street who is important in aviation, he will doubtless roll off the names of a dozen or more pilots, male and female, who have gone somewhere and done something in an airplane. I would be the last one to minimize the importance that sensational flights have had in the past—and that sensible ones will continue to have—in arousing public interest and stimulating air travel. But I would add the names of many pilots the public has never heard of, who, nevertheless, have made very valuable contributions to the aviation *business*. After all, that's what it is—a *business*. The sensational flights are merely the advertising trimmings.

One of these pilots whose contribution I would rate highly is Harold A. Elliott, vice president and operations manager of Eastern Air Transport, and former naval officer during the late war—fought without benefit of battleships. It is to men like Elliott—and there are many like him in this business—to whom I look for the sane, safe operations of aircraft that must become more general before public confidence can be won to the extent needful to assure our financial prosperity. Sensible policies, such as Elliott directs on E. A. T. and that other farseeing operations managers direct on other lines, must become general, not only on airlines, but in all branches of aviation, before that public confidence can be won by aviation in its entirety. That we are winning it, slowly but nevertheless certainly, is due to the intelligent efforts of men like Harold A. Elliott.

He got off to an early start in March, 1917, by entering the Ground School for Naval Aviation at the delightfully sleepy city of Pensacola, Florida. It is this start from Pensacola that gives Navy flying officers that philosophical air, that appearance of quiet, placid waiting that distinguishes them from Army officers. Things are so pleasant at Pensacola that nobody ever wants to leave; the dreamy old Air Station, bathed in Florida sunlight, the old buildings, the ancient Spanish forts nearby, the placid pelicans in the bay, all seem to murmur, "What's your hurry? Wait, rest, take your time; there is always another day; lounge awhile, and ponder."

I spent three months there, some years ago, selling a training plane to the Navy.

From placid Pensacola the quiet Elliott gradually oozed off to France, not hurrying or anything, just sort of easing off toward the war. He took flight training in the French army and navy, the Royal Air Force, and the U. S. Army, in 1917; from which it appears that he must have collected a most liberal flying education. Nor was his education in other matters neglected—or else I don't know my troops.

During the war Elliott saw service at the Naval Air Station, Dunkirk, France, and in Italy. I asked him for details of his war service, but he modestly contented himself with giving me one experience which was very unusual. "While returning to Dunkirk from a patrol," he writes, "I was flying approximately three miles off shore over the North Sea at an altitude of about 1,500 feet. Suddenly, without any warning, my ship began to tumble and roll and was completely out of control. The only reaction I could get at the time was that I seemed to be falling and tumbling upward. Being quite a young pilot at that time, naturally this terrified me; and, of course, I felt that my impressions were at fault and in reality something had happened to the ship, and that I was falling or spinning in, and would soon crash.

"After what seemed like an eternity I regained control of the ship and it seemed to fly just as normally as before. When I looked at my altimeter I noted with great surprise that I had gained about 1,000 feet in altitude, which puzzled me more than ever. In trying to figure this out, I happened to look over the tail of the ship and saw a great column of mud and water descending into the sea, and that explained to me what had happened. Every afternoon all of the mines that were collected by the mine sweepers in clearing the channel between Dunkirk and Dover, and other points between France and England, were anchored at this spot in the North Sea, and were exploded by a gun from a shore battery. I happened to be over this spot just in time to receive the concussion from the explosion."

An occurrence somewhat similar to this was experienced by a friend of mine while flying over Washington, D. C. He was hurled upward some 768 feet, and was quite unable to account for it—until he learned that Senator Brookhart had been making a speech at the time. All pilots are warned to detour around the lethal gas area on Capitol Hill, and also to avoid flying over the Naval Publicity Department in the Navy Building during a conference. And it is just as well to keep away from the vicinity of the White House when those numerous commissions are turning in their reports. Especially the Wickersham Commission.

After the war Elliott flew ships from battleship gun turrets, playing the same part in the Navy that a grain of puffed rice plays at Battle Creek. He began the development of aerial fire control for the Pacific Fleet, organized landplane training squadron at Pensacola, Florida, and was on the Pulitzer Race team in 1922. He was General Inspector of Naval Aircraft at McCook Field, test pilot and Flight Project Engineer at the Naval Aircraft Factory, Philadelphia; and in 1927 left the Navy to go with Pitcairn Aviation, Inc., as assistant operations manager of Eastern Air Transport, Inc., being one of the few vice presidents to survive the Great Push—out—of 1930. Of course he is married—no really good man seems to escape—and has two children whom he is raising in the cultured atmosphere of Jackson Heights, Long Island.

AND now, my friends, it is my sorrowful duty to enter in the pages of AERO DIGEST the flying autobiography of that good and true friend, that brave and cheerful spirit, that admirable officer and gentleman, the late William C. Hammond of the United States Army Air Corps Reserve. It is, I feel, entirely fitting and proper that I should do this, and in this place, devoted though it usually is to the lighter side of life. For life, after all is a



W. C. Hammond



BLAZING THE TRAILS OF THE AIR

WHEN aircraft routes must march out ahead of flying base development and depend largely upon unimproved landing fields, Aerol Oleo-Pneumatic Struts are almost invariably called upon to reduce landing and take-off hazards.

Typical of this service to flying is the experience of the Wien Alaska Airways, Inc., operating Hamilton Metalplanes along the Siberian Coast. Mr. Noel Wien, President, writes:

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(PersonAIRlities continued)

mingling of comedy and tragedy, of happiness and sorrow; it includes not only the merry laughter of yesterday and today, but also the final irrevocable fact that seals our lips with silence and bids us rest.

The spirit of William C. Hammond lives today, and will live so long as there are members of his family, so long as there are friends to think of him. And as I think of him now, it is with mingled feelings of sorrow for his passing, and gladness that I have had the pleasure of knowing him, for his was a cheerful spirit, an understanding nature, that made lighter and brighter the way of those who knew him.

The history of his flying that I give to you now was written at my request, in my office some three months ago. He sat down at my typewriter and tapped it off, pausing at times to chat with me about our old days of the war, and about commercial aviation today. I give you his writing unchanged; it shows more clearly than words of mine could do the cheerful, useful life that was his, a record of which I would leave you.

"Along in March of 1917, I saw the chalk marks on the wall, and submitted an application to the Aviation Section of the Signal Officers Reserve Corps. This step was without basis or foundation of any description whatever, for, at that time, the difference between a spark plug and a cylinder gasket was, to me, one of the deep dark mysteries of Mechanical Engineering, in which art I was totally devoid of knowledge. I could drive a Ford in a teetering sort of fashion but had never attained a velocity greater than thirty miles per hour in anything.

"For no good reason at all, they accepted me! They dubbed me Private more or less first class, and pinned a one-way ticket to Cornell Ground School on my O. D. uniform, size 44. Far above Cayuga's waters I perspired. No, I sweated over the intricacies of a Hall-Scott motor of doubtful origin, and the Da-De-Dada of the practice buzzer. After six weeks of double timing, and squads east, I came out of that tail spin with a sheet of paper that said, in effect, that Major Howard C. Davidson's leftenants had done what little they could to ignite the spark of intelligence, and were passing me on to other instructors at Selfridge Field in hopes that they might be able to accomplish something. The general tone was dubious; and, as I recall, there was no mention of *Cum laude* anywhere on the paper.

"After two weeks under the wingspread of Mort Newhall, that Gent remarked that there didn't seem to be any real good reason for killing us both, so he sent me solo. In the following days I piled up the large total of twenty-five hours, and invested in a pair of First Lieutenant's bars, and a Sam Browne belt.

"On October 15th, in the disguise of a First Lieutenant, I set sail for the War Zone, eager to do battle with the minions of the Kaiser, believe it or not. After Liverpool and a so-called British Rest Camp at Le Havre, we descended on, and took, Paris. I was willing to let it go at that, but some gold hat at 45 Avenue Montaigne had other plans. So I got a *billet militaire* to Issoudun in a forty and eight. Here the war took a turn for the worse. Never in all my life had I seen as much so-and-so mud.

"One dull, drizzly morning I was summoned to headquarters, where one Lieutenant Cobb handed me a blue piece of paper with a lot of white lines and figures on it. I looked it over efficiently in a very military manner. I turned it sideways, and still it made no sense. It was the same upside down. I didn't know whether to sing it or try it on the ukulele. Finally a booming voice said, 'I want six Mess Halls.' Then the truth dawned on me . . . . It was a Blue Print. Assistance was something I didn't need nothing else but! Approaching the company of men assigned to execute this building program, I piped, 'All of you men who have ever handled a hammer, hatchet, or buzz saw, step one pace to the front.' And God Bless 'em, six stepped out. Between us we formed a plan of attack, and I learned about Mess Halls from them.

"The C. O. asked for volunteers to go bombing. All volunteers were A. W. O. L. We had come to France to fight, not to drop bombs on ammunition dumps. Besides, we had heard that all bombers were duck soup to Fokker V-7's, so the C. O. posted a notice on the bulletin board which said, 'The following ten First Lieutenants WILL report to the school of aerial bombardment at Clermont Ferrand.' And behold, the name that led all the rest was right up my alley. Right there things began to look up. When we ten Louies arrived at the Seventh A. I. C., there were exactly ten Cadillac sedans and nobody to exercise the nine that the C. O. didn't use. Suffice to say that from Saturday noon to Monday morning, flying at Clermont Ferrand was as scarce as turtle feathers, but in those Cadillacs—Ah! That was different! Every week-end nine Non-Com's sat at the wheels of nine Cadillacs, and somewhere in the luxurious caverns of the rear seats sat nine Lieutenants. Some flew East, some flew West, but most of them wound up in Paris. And to think—we—didn't—want—to—go—bombing! What a war! If it only lasted long enough.

"I taught formation flying there at Clermont Ferrand, aerial bombardment for both pilots and observers, and aerial gunnery. Had one tour of duty at the front with *Groupe de Bombardement* No. 5 of the French Group at Neuf Chateau and returned to instruct again at Clermont Ferrand. In August of 1918 I was sent to America on temporary duty with two other members of the personnel of the bombardment school to assist in the training of bombardment groups in this country. I had charge of bombardment training of the First Provisional Wing at Roosevelt Field, and left the service January 9, 1919, accepting a Reserve commission which I now hold.

"In 1927 I started flying commercially for the Curtiss Flying Service at Garden City under M. M. Merrill. In 1928 I had charge of the Portland, Maine, airport for Curtiss. In July of the same year, I dusted 1,030 acres of Northern Maine's blueberry lands for the Department of Agriculture, and Curtiss. The year 1929 found me flying Fokkers up and down the West Indies for Pan American Airways between Miami and San Juan, Porto Rico. In 1930 I served a period with the Department of Commerce as a Field Inspector covering pilots, mechanics and ships throughout Michigan, Ohio, Pennsylvania, and New Jersey. In May I received an assignment from the NYRBA Line to act as one of the two pilots for the National Geographic Society's expedition to South America starting at North Beach, L. I., and going through the West Indies, Virgin Islands, the Lesser Antilles, Brazil, Uruguay, Argentina and Chile. At the expiration of that trip, I took up my regular assignment as Ford pilot on the line from Buenos Aires to Santiago, Chile, around the Andes, which run was recently discontinued when Pan American bought the NYRBA Line."

According to the press reports, he passed from life on January 16, 1931, in the quiet depths of a grove of trees near Bartow, Florida, into which his airplane fell after a 3,000-foot drop in a tail spin. That is a fact, the sadness of which cannot be lessened by any words of mine. To his family and his other friends I offer sympathy and the thought that death, after all, is a sorrow only to those who remain to grieve, and not to him who has gone ahead to fly the course that all of us one day must follow.

Nor is it, I truly feel, so terrible after all, to leave the earth while life is yet worth living; to take off on our final flight when the air is warm with sunshine, when the spirit is joyous within, when earth and sky and sea combine in a symphony of beauty to soothe the soul; and then, to pass quickly, after only a few moments of concern, into the peace and rest of Eternity—is *that* so terrible? I cannot think so. More happy by far is it to go like that than to toss for long weeks on a bed of pain; more happy, I say, than to grow old and feeble, a burden to ourselves and to others.

So good-bye, Bill, my dear friend, and God bless you. You have only gone ahead on the trail that all must take, and we are left to follow when we may.



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The AIRLINES of MEXICO



By M. C. Cooper

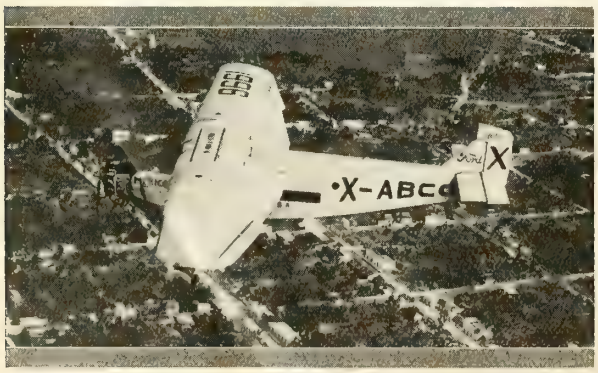
IN 1325 the wandering Aztecs planted their Eagle standards on an island in Lake Texcoco. In 1920 Lloyd A. Winship and E. L. Hammond flew the first commercial planes—two Lincoln Standards—over the Republic of Mexico into that same ancient center known today as the City of Mexico. Could the Cuauhtemoc (Swooping Eagle), the last of the emperors of the Aztecs, return to the Valley of Mexico today he would gaze in superstitious horror at the present day mechanical symbols of his own name. Even more amazed would he be—if he could even comprehend their significance—at the great systems of aerial transport which traverse Mexico today.

The oldest service that has been a continuous financial success in Mexico was established in 1921 and operated under the name of Compañía Mexicana de Transportación Aérea, S. A. The oil companies, which had brought the city of Tampico into prominence as a distributing center during the height of the oil producing industry in Mexico, were in urgent need of protection against heavy losses of payrolls resulting from bandit raids. With the introduction of airplane service for the delivery of the payrolls from the Tampico headquarters to the surrounding field offices, comparative safety was assured the companies. Planes flew over the oil camps, dropping the leather sacks of gold and silver at interior places where landing was impossible.

In 1924 this company was sold and became the Compañía Mexicana de Aviación (Mexican Aviation Company). Aside from the delivery of payrolls and taxi service, lines were established, operating upon need, from Tampico as far south as Tlacotalpan River (south of Veracruz) and to Oaxaca and Amatlan on the west coast.

On April 15, 1928, the first regular airline of Mexico was inaugurated between Tampico and Mexico City, and on October 15th of the same year a line was opened from Veracruz to Merida in the Yucatan Peninsula. On February 19, 1929, the Compañía Mexicana de Aviación became a subsidiary of Pan American Airways, Inc., and is now operated as the Mexican division of that system.

Today this enterprise operates two daily lines and two tri-weekly lines, reaching from Brownsville (Texas) to the Central American city of San Salvador. The five-and-a-half-hour service between the City of Mexico and the border at Brownsville and the two-hour-and-fifteen-minute service between Tampico and Veracruz operate daily. On the tri-weekly service planes operate between Veracruz and San Salvador on six-hour-and-forty-minute runs.



Joining the United States and Mexico by air; a Ford trimotor of the Mexican division of Pan American Airways

All passenger planes on these lines are trimotored, being either Fokker or Ford. Fairchild planes fly with the mail. The large and well-equipped reconditioning shops of this company, located at Brownsville, receive every ship for motor overhaul after 250 flying hours and for complete overhaul after every 800 hours.

A new line between Merida and Havana will soon be in operation. This run, which will be a part of the Mexican division of P. A. A., will pass over the island of Cozumel which has an excellent airport and is noted for ancient Maya ruins. This line will afford travelers between Cuba and the United States a direct three-day journey between the two countries by way of Mexico.

During the past summer the Mexican division of Pan American Airways put on an "all-expense" airplane tour from the United States to Mexico City via Tampico and Veracruz. The first of its kind in the Republic, this trip afforded a week's journey with a trip from Brownsville to Mexico City and return via air. Sightseeing tours included a full day in the capital, one at the pyramids of San Juan Teotihuacan, another at the Desert of the Lions, and still another at the floating gardens of Xochimilco. Another of these tours included a three-day tarpon fishing and hunting trip at Tampico. All arrangements for the sporting activities were made by the company.

Bridging the distances between the border and the especially inviting parts of Mexico, and surmounting the obstacle of time for the tourist and visitor, these tours were exceedingly popular with not only the sportsman and the business man with limited vacation time, but for all who made the trip.

Within the last two years other lines have been established in the Republic, making air travel available in most parts of Mexico. With very little overlapping of lines, most of the principal cities are reached by air, and as the result of coöperation between the various companies, convenient connections have been made possible at the aerial junctions.

Corporacion Aeronautica de Transportes, S. A., of which Theodore T. Hull is president, was inaugurated August 17, 1929. With headquarters at Torreon, Mexico, this line operates across the Republic from three points in the United States—El Paso, Brownsville and Laredo. A daily service is maintained between El Paso and Mexico City and between Brownsville and Mazatlan, the two lines crossing at Torreon. The service from Laredo goes to Tampico via Monterrey. Making connections with Southern Air Fast Express at Brownsville and the Standard Air Lines division of Western Air Express at El Paso, the C. A. T. line maintains an average time between the latter City and Mexico City of little more than seven hours, including stops at Chihuahua and Torreon. Lockheed Vega planes are used over this line.

A tri-weekly service along the western coast of Mexico between Los Angeles and Guatemala City via Mexico, maintained by the Pickwick Latin-American Airways, was suspended in April, 1930. At the present time there are

(*Continued on page* 148)



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EUROPEAN, AFRICAN, AUSTRALIAN AIR TRANSPORT SERVICES

By L. E. Ring

Aeronautic Trade Division
Department of Commerce

THE increasing world-wide trend toward the adaptation of the airplane to commercial uses is strikingly illustrated by the figures of scheduled air services for 1930 in Europe, Africa and Australia and by the accompanying maps, showing the extent and routes of the various air transport systems now established and those proposed for the near future. The services in actual operation during the year just closed covered 72,084 miles of airways in Europe, 3,769 miles in Africa, and 9,458 miles in Australia, as compared with 49,425 miles in the United States.

In Europe, as in the United States, the recent steady developments may be attributed to the greater efficiency resulting from improved equipment and more systematic operation and to increasing air-mindedness. Night flying is not carried on so extensively as in the United States, because of the lack of lighting facilities on many routes; but several important night air mail services were in operation during the summer of 1930. Considerable extension of facilities for night operations are planned for 1931.

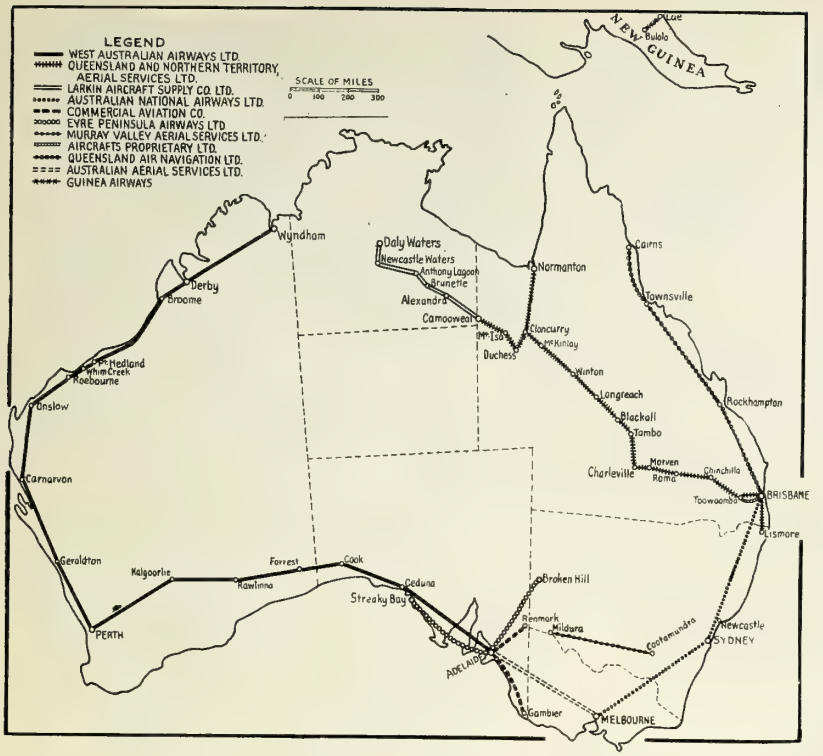
Of the 72,084 miles of airline routes under schedule in European countries, 9,865 miles represent routes operated by coöperative arrangements between companies of different nationalities. The remaining 62,219 miles cover the routes operated independently by European companies—54,484 miles being served by French, German, Netherland, British and Italian planes, and the rest being divided among services in Poland (1,797 miles), Czechoslovakia (1,137 miles), Belgium (923 miles), Spain (856 miles), Austria (776 miles), Hungary (291 miles), Switzerland (618 miles), Finland (237 miles), Rumania (236 miles), and Denmark (179 miles).

Existing services in Africa are not extensive, but additional lines are proposed to connect British and French Africa with the mother countries. At least one of these is expected to be operating on regular schedule by the late spring of 1931.

In Australia the awarding of air mail contracts has made possible the estab-



Map of the air transport routes of Europe, with indications of the national and coöperative lines



Above, airlines of Australia

lishment of a chain of airways bordering all but a comparatively short stretch of the periphery of the continent.

Germany.—In point of domestic mileage, Germany still leads the field of European air transportation. The extensive network of German air routes lies largely within its boundaries and the entire mileage is confined to Europe. It is an interesting fact that of the 9,865 miles of air services in Europe operated by coöperative arrangements between companies of two or more different nationalities, the German company, Deutsche Luft Hansa, participates in the operation of 6,966 miles. Deutsche Luft Hansa coöperates with companies of Austrian, Czechoslovak, Danish, Netherland, French, Italian, Russian and Swiss nationalities over airways connecting Berlin with the principal cities of Europe and with Leningrad and Moscow.

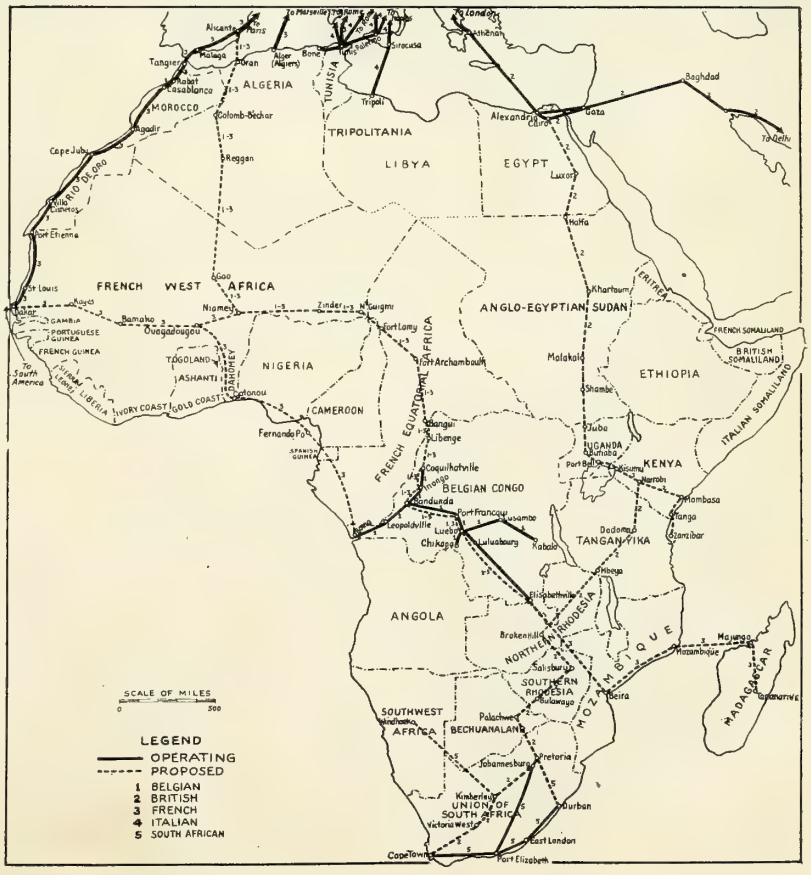
France.—Considering total services operated at home and abroad, France has the greatest mileage, accounting for 18,542 miles. Included in this figure is the system operated by Compagnie Générale Aéropostale in South America, covering 6,917 miles; this is connected to the home routes by airline down the west coast of Africa to Dakar and by steamer transportation across the Atlantic Ocean to Natal, Brazil. Another French service extending beyond the boundaries of Europe is the line, 2,545 miles in length, from Marseille to Baghdad, which is scheduled ultimately to connect with the existing Bangkok-Saigon route in the Far East. Services across the Mediterranean from France to the African mainland are operated from Marseille to Algiers and from Marseille to Bone (Algeria), via Ajaccio (Corsica) and Tunis.

Netherlands.—With the inauguration, on September 25, 1930, of a line extending 9,195 miles from Amsterdam to Bandoeng, Java, the Netherlands attained a leading position in miles of air services operated. The East Indies line, the longest in the world, brings the Netherland colonies within twelve days of Amsterdam. In Europe, the Royal Dutch Air Transportation company operates exclusively three routes with total length of 868 miles, connecting Amsterdam and Rotterdam with London, Paris, Brussels and Berlin; in addition, 1,445 miles of services are operated in coöperation with German, Swedish and Swiss companies.

Great Britain.—All the scheduled air routes of Great Britain in 1930 were international, with the exception of a regular service operated during the summer between London, Birmingham, Liverpool and Manchester. Of the 6,298 miles of airways operated by the British Imperial Airways, 5,224 miles are over the route

(*Continued on following page*)

Below, present and future African lines



(*Continued from preceding page*)

from London to Delhi, India. Planes leave London and Delhi weekly, and the journey is made in 7½ days as compared with 16 days by the fastest possible surface transportation. Regular flights are made from London to Paris, Basel, Zurich, Brussels and Cologne on the Continent.

A new British route, running the length of the African continent from Cairo, Egypt, to Cape Town, South Africa, a distance of 5,750 miles, is reported to be scheduled for regular operation within a few months. The section of this route from Cairo to Kisumu, Kenya, is expected to be opened late in March, 1931, when the first regular flight is scheduled to be made. Kisumu is located on Lake Victoria, 2,620 miles from Cairo. The service will be extended over the remaining 3,130 miles to Cape Town when suitable meteorological and landing facilities are provided.

Italy.—The system of air transport routes centering in Italy comprises a total length of 7,763 miles. The use of seaplanes over most of the airways is a distinctive feature. Though Italy is not generally adaptable to the building of landing places for land equipment, sheltered harbors along the coast and on the numerous rivers afford excellent bases for seaplanes, and this condition, added to the fact that Italy's airways are largely over water, accounts for the general use of seaplanes. Besides the Mediterranean routes connecting Rome and Naples with the islands of Sardinia and Sicily and with Tunis and Tripoli on the north coast of Africa, regular services are maintained from Brindisi to Istanbul via Athens, from Athens to the island of Rhodes, and from Rome to Barcelona via Genoa and Marseille. Internal lines connect the principal cities of the country, and routes totaling 252 miles in length are operated between the Albanian cities of Valona, Tirana, Coritza, Scutari and Argirocastro. Italian companies coöperate with the Deutsche Luft Hansa in operating a service between Milan and Munich, and with the Austrian company Oesterreichische Luftverkehrs (Austrian Air Transportation Co.) on a line between Venice and Vienna.

Until 1929 commercial air transportation activities in Africa were limited to the French mail service down the west coast and the "Sabena" (Belgian Air Transportation Co.) lines in the Belgian Congo. In that year, air mail services were opened by a South African company between Cape Town, Port Elizabeth, Durban and Johannesburg, over 1,438 miles of airways. Existing lines in the Belgian Congo have a total length of 2,331 miles. Mention has been made of the 5,750-mile British route from Cairo to Cape Town, which is expected to be in full operation by the late spring of 1931. France and Belgium have completed negotiations for the establishment, in the near future, of a coöperative line from Brussels and Paris across the Sahara Desert, French Equatorial Africa and the Belgian Congo to Elisabethville. The ultimate plan of the French is to extend this line from Elisabethville to Beira, Mozambique and across the Indian Ocean to Madagascar.

The great distances between important cities make the airplane an advantageous means of communication and transportation in Australia, as in the United States. Much of the interior of Australia is inadaptable to profitable commercial flying because of the scarcity of population, most of the inhabitants and all the important cities being located in the coastal regions. The result has been the establishment of a system of airlines, 9,458 miles in length, which extends almost completely around the continent. Weekly services are operated over 6,375 miles of these lines and the frequency of service over the remaining routes varies from twice a week to daily.

In the mining districts of New Guinea aircraft were found to be so useful in transporting provisions and supplies to the miners that a scheduled service was inaugurated between Lae and Edie Creek by which goods are carried the distance of eighty miles in one hour as compared with several days by means of pack animals.

EUROPEAN AIRLINE MILEAGE

	Miles
Austria	
Exclusively Austrian Lines	776
Coöperative Lines	1,380
Austrian-German	311
Austrian-Czechoslovak-German	332
Austrian-Italian	323
Austrian-Yugoslav-French	414
Belgium	
Domestic Lines	923
Czechoslovakia	
Domestic Lines	1,137
Coöperative Lines	713
Czechslovak-Austrian-German	332
Czechoslovak-Swiss	381
Denmark	
Domestic Lines	179
Coöperative Lines	988
Danish-German	318
Danish-French-German	670
Finland	
Domestic Lines	237
Coöperative Lines (Finnish-Swedish)	232
France	
Exclusively French Lines	18,542
Coöperative Lines	2,987
French-Austrian-Yugoslav	414
French-Danish-German	670
French-German	1,157
French-Spanish	746
Germany	
Domestic Lines	11,818
Coöperative Lines	6,966
German-Austrian	311
German-Austrian-Czechoslovak	332
German-Danish	318
German-Danish-French	670
German-Dutch	642
German-French	1,157
German-Italian	286
German-Russian	1,759
German-Swiss	1,491
Great Britain	
Exclusively British Lines	6,298
Hungary	
Domestic Lines	291
Italy	
Exclusively Italian Lines	7,763
Coöperative Lines	609
Italian-Austrian	323
Italian-German	286
Netherlands	
Exclusively Dutch Lines	10,063
Coöperative Lines	1,445
Dutch-German	642
Dutch-Swedish	363
Dutch-Swiss	440
Poland	
Domestic Lines	1,797
Rumania	
Domestic Lines	236
Spain	
Domestic Lines	856
Coöperative Lines (Spanish-French)	746
Switzerland	
Domestic Lines	618
Coöperative Lines	2,312
Swiss-German	1,491
Swiss-Dutch	440
Swiss-Czechoslovak	381
Yugoslavia	
Domestic Lines	685
Coöperative Lines (Yugoslav-Austrian-French)	414

TOTALS

Lines operated exclusively by one nation	62,219
Coöperative Lines	9,865
Grand Total	72,084

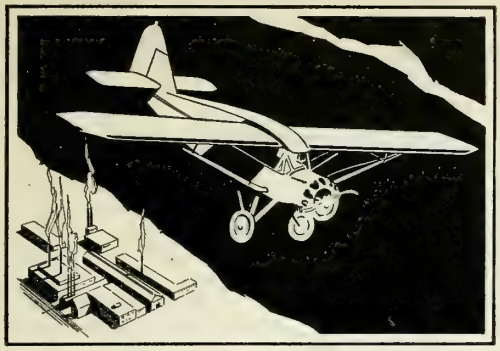
A LINE of alternating current electric plants has been announced by D. W. Onan & Sons, Minneapolis, Minnesota.

This is a gasoline electric plant generating 110-volt, 60-cycle, alternating current, made in three sizes, 500, 1,000 and 2,000 watts, and in six models, manual and self starting.

In these plants a four-cycle, single-cylinder engine is connected through a special flexible coupling to an alternating current generator of compound, separate excited type, which is so wound and balanced as to produce even voltage and accurate cycle.

A SUMMARY of the first four months' operation of the New York, Philadelphia and Washington Airway shows that the company carried more than sixty per cent capacity on its twenty daily trips between New York and Washington.

Instead of the usual slump in passenger travel expected by air transport companies in winter, December patronage on the Ludington Line exceeded that of November. A reduction in tariff on November 24, making possible a round trip fare of $20.00, no doubt contributed to this increase in the company's passenger traffic.



ONE BELLANCA SELLS ANOTHER



WHEN the facts about Bellanca planes are known, a Bellanca is bought. In 1930, so-called year of depression, Bellanca sales exceeded those of the previous year by almost 30%. Lower cost of competitive products, or concessions of various kinds, fall far short of overcoming superior Bellanca performance, Bellanca construction and Bellanca safety. Bellanca owners know that ***these features mean economy in the long run.*** They have proved by experience that the best is cheapest, and therefore they have become the most effective Bellanca salesmen!

Bellanca models carry six or twelve passengers. Speeds range from 145 to 150 miles per hour. All are single engine planes, with power plants of 300, 420 and 600 h.p. Swift and safe, sure and sturdy, Bellanca planes are proved to be the most efficient — carrying the greatest payload with the best performance at the least expenditure of power.

BELLANCA AIRCRAFT CORPORATION

NEW CASTLE, DELAWARE

New York Office: Chrysler Building

Canadian Distributors: Bellanca Aircraft of Canada, Ltd., Montreal

At the home port of Five BELLANCA Owners who have harnessed their planes to business

The photograph above shows a line-up of Bellancas at Fairfax Airport, Kansas City — an interesting example of the fact that "one Bellanca sells another." The owners, from left to right:

Thurmond Aircraft Corporation; Bruce Dodson, Service Aircraft Corporation; Western Telephone Company of Nebraska; Kansas Pipe Line & Gas Company; Win M. Campbell.

BELLANCA

BELLANCA

CURRENT AIRPORT and AIRWAY FACTS

A "HOMING" device which permits pilots to use any commercial broadcasting station as a guide has been invented by Goeffrey G. Kruesi, radio research engineer of Western Air Express, who perfected the device while under the department headed by Herbert Hoover, Jr., chief engineer.

By tuning in on the long-wave frequencies used by commercial stations, a pilot can obtain information to lead him to any station he selects.

Tests of the invention were recently conducted by more than seventy-five officials of the Navy air service, the Signal Corps of the Army, and the Department of Commerce. In the tests observers were stationed at various broadcasting stations around Washington, D. C., to broadcast directions to an Army observation plane in a flight. When the pilot, guided by the finder, flew over the various stations, the device was pronounced successful.

ONE of the world's largest airplane hangars, 248 feet wide and 310 feet long, has just been completed by The Austin Company, engineers and builders, at the United Airport near Los Angeles. The Austin Company also designed and built the $1,500,000 port of the United Aircraft and Transport Corporation, where the hangar is located.

The hangar, completely equipped, represents an investment of $175,000 and is the first of three of equal size proposed for this port. Approximately 77,000 square feet of floor space are available for the housing of planes.

A MARKED decrease in fatal accidents in air transport during the last six months of 1930 is revealed in figures released by Clarence M. Young, Assistant Secretary of Commerce for Aeronautics.

Only two persons were fatally involved while riding as passengers in an airplane engaged in scheduled operations during this period, as compared with twenty-two in the same type of service during the previous six-month period.

Estimates by the Department of Commerce place the total miles flown during the last six months at 20,000,000 and passenger mileage at 60,000,000. The two persons killed were involved in the same accident, which occurred late in November. The pilot also lost his life in the accident. There were only two other fatal accidents in scheduled air transportation in the last half of 1930. Each involved an air mail pilot. All the accidents of which the Department has a record occurred at night, and unfavorable weather was advanced as the primary cause.

Increase in safety is attributed to conformance of operators to commerce regulations, excellence of aircraft and engines, and development by the Department of Commerce of airways lighted and equipped with landing fields.

CONTRACT for a combined radio telephone and visual type radio range transmitting equipment which will broadcast voice and range signals simultaneously has been placed with the Westinghouse Electric and Manufacturing Company by the Aeronautics Branch of the Department of Commerce.

The combination radio telephone and radio range transmitter was developed by the Aeronautics Branch. Another innovation to increase the usefulness of radio to the industry is the development of a method whereby two adjacent independently operated range stations may transmit on the same frequency. This method, designed to conserve the limited number of frequencies available, involves the synchronization of the transmission of the radio range stations by means of clocks equipped with special contacting devices which control the automatic keying of the transmitter. This permits the stations which are synchronized to operate one minute "off" and one minute "on" alternately.

The combination radio telephone and radio range transmitter will enable the airman flying along the airways to receive simultaneously on one radio frequency channel both radio guidance signals and weather and other information by voice without carrying two receivers. The only change necessary in the radio equipment on the aircraft will be the addition of a filter. This unit will weigh only about one pound and will require little space. Its functions will be to direct the voice signals through the headphones and the radio range signals through the vibrating reeds of the indicator on the instrument board.

The combination transmitter, which is to cost $25,000, will be used at first for experimental purposes and later will be put in active service, if results are satisfactory.



New hangar built by The Austin Company at United Airport, Burbank, California

THERE were 125 more airports and landing fields in existence in the United States on December 31, 1930, than there were five and one-half months ago, according to the Aeronautics Branch of the Department of Commerce. The largest increase was in municipal ports, there being ninety-seven of this class established.

AIR travel this winter on the Kohler Aviation Corporation planes across Lake Michigan has shown a decided increase over the same period a year ago.

With the advance of cold weather, traffic has maintained an almost even level with the summer average. In contrast to one year ago, when a decided slump was noticed, October, 1930, showed a gain of fifty-eight per cent over October, 1929, and November, 1930, surpassed the same month of a year ago by eighty-five per cent.

Express handled eclipsed the totals of 1929 by far, a fact that is explained by the development of a service known as Kohler Air Dispatch. The company now carries an average of 10,000 pounds monthly as opposed to a maximum of 500 pounds in 1929.

PLANS for a seven-hour service between Fort Worth, Texas, and Washington, D. C., have been announced by the Bowen Airlines of Fort Worth. Six Lockheed Sirius monoplanes have been ordered, which, it is claimed, will be the fastest in regular service in the world.

Bowen Airlines now operates between Houston, Fort Worth, Oklahoma City and Tulsa.

THE TULSA AIRPORT POW-WOW

By C. W. SHORT, JR.

(With Apologies to Cy Caldwell)

SEMINOLE, Osage, Choctaw, Creek, Cherokee, Navajo and Pawnee; tomahawks, scalps, squaws, papooses, teepee, sign language and war whoops. Airport managers, airport equipment, unbelievable stories, doubting Thomases, camp fires and an occasional bow and arrow casualty. This is Tulsa, the Oil Capital of the World; the Cross Roads of the Air; the Paris of the West; the Home of Broken Down Pilots and the scene of the National Airport Conference 1931.

When the long covered wagon train bearing the airport managers circles the airport preparatory to a three-day stop, it will be greeted by the airport Indian princess hostess, Lilio-Ka-Lani, descendant of the famous Indian Bull family and necessary to any Oklahoma bull session. After being welcomed in this royal manner, the delegates will be transported to the city in eight new extreme-lined ox carts, the pride and joy of the Oklahoma Rapid Transit Company.

Probably the most sensational event of the conference will take place the first

(Continued on page 118)

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Volume Two takes up the various types of engines in use with detailed descriptions of the leading makes such as the Wright "Whirlwind" and "Cyclone," the Pratt and Whitney "Wasp" and "Hornet," Anzani, Cirrus Mark II and III, Packard, Curtiss and Caminez air and water-cooled types and their accessories. It also covers engine installation, instruments, propellers, reduction gears, starters, engine repair, dirigible airship engines, etc. **Price, per volume $5.00; Both volumes—$9.00.**

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THE AIR SERVICES

AIRCRAFT IN NAVAL WAR MANEUVERS

TWO hundred and seventy-three planes and the airship *Los Angeles* will participate in the annual winter maneuvers of the United States fleet. In addition to the aircraft, 137 surface ships will participate as will 2,900 officers and 33,000 enlisted men. Fleet concentration will be held off Panama from February 12 to March 24 and naval air concentration will be made in the Caribbean from March 24 to April 3.

Torpedo attacks by destroyers and bombing attacks by planes will be integral parts of the maneuvers. Staffs of the various admirals engaged in the games will use the opportunity of the concentration to discuss and plan for the extensive reorganization of the fleet which is to go into effect in April immediately after the completion of the maneuvers. For the first time, aircraft carriers will be operated in conjunction with modern 10,000-ton cruisers and the airplane will play a more important part than ever before in the history of these maneuvers For the first time also, the *Los Angeles* will be operated as part of the fleet and will participate in one of the special problems incident to the fleet maneuvers. Permission of Great Britain, Japan, Italy and France was requested in order to send the airship to the maneuvers, because the *Los Angeles* was awarded to this country under the Treaty of Versailles with the understanding that it should be used only for commercial and experimental purposes, unless permission for other use was obtained.

Fleet concentration at Panama will consist of two phases, a naval war problem, February 17-21, and fleet maneuvers ending March 24. For the initial phase of concentration, a naval war game between the Battle Fleet and the Scouting Fleet will be staged in the Pacific in the vicinity of lower Central America. An attacking force under command of Admiral F. H. Schofield, Commander in Chief, Battle Fleet, will attempt to establish an advance base on the mainland in the face of a defending force commanded by Vice Admiral A. L. Willard, Commander of the Scouting Fleet.

Under Admiral Schofield's command will be a naval fleet consisting of ships of the Battle Fleet, and Light Cruiser Division Five consisting of four eight-inch gun 10,000-ton cruisers normally attached to the Scouting Fleet. Attached to the Scouting Fleet, under Vice Admiral Willard's command, will be a naval fleet comprising ships of the Scouting Fleet, the aircraft carriers *Saratoga* and *Lexington,* the airship *Los Angeles,* the submarine V-4 and the submarines at Coco Solo, C. Z.

Following the naval problem, which will be completed in about two weeks, the combined fleet will engage until March 24 in a series of tactical exercises designed to weld the fleet into a homogeneous fighting unit.

From March 24 to April 3 the Scouting Fleet, with the aircraft carriers *Saratoga* and *Lexington,* will carry out a series of war problems in the Caribbean. In these problems naval patrol planes attached to the Scouting Fleet and occupying a theoretical advanced base in the West Indies, will scout for the enemy naval forces in the Caribbean. Both the attacking and defending naval forces will employ aircraft in numbers.

The aims of the maneuvers, according to Admiral Jehu V. Chase, Commander in Chief, United States Fleet, are "to develop strategic scouting, employment of carriers with light cruisers, employment of heavy cruisers, defense of a long coastline, attack of a convoy, test of communications and oiling at sea. These problems are particularly interesting at this time as they immediately precede a general reorganization of the United States Fleet."

In 1927 the maneuvers were held at Honolulu; in 1928 at Panama; and in 1930 at Colon on the Atlantic side of the Panama Canal and around Cuba and the West Indies.

New Flight Record Established at Pensacola Naval Air Station

A NEW record of total flying time for all aircraft at the Naval Air Station, Pensacola, Fla., during a single week was established during the week ending December 13, 1930, when 2,957.35 hours were flown. The previous record of 2,584.55 hours was made during the week ending February 14, 1930.

There were 3,042 training flights made during the week in which the new record was established, an average of 507 flights daily for six days. These training flights were made in 118 planes, an average of approximately five flights per plane per day made by 325 students.

Air Corps Develops Apparatus to Determine Altitude When Landing in Fog

A DEVICE designed to permit the pilot of an airplane landing in a dense fog to determine at any instant the height above ground has been developed by the Army Air Corps in coöperation with engineers of the General Electric Company. The device, known as the "Sonic Altimeter," shoots a sound wave to the ground, receives the reflection of the sound and measures the time required for the sound to return. The distance of the plane from the ground is then estimated by the length of the interval.

The Sonic Altimeter consists of a whistle which is blown at regular intervals by power from the engine of the airplane, a mechanism which catches the echo, and a dial on which may be read the altitudes greater than fifty feet. A plane equipped with this device may arrive over a field where a "blind" landing is to be made and descend to a height of 200 feet which may be determined by means of the Sonic Altimeter. The engine is then throttled, the plane settled in a normal glide and the sound mechanism placed in operation. As the ship comes in for the landing, the altitude is constantly estimated by determining the interval required for the echo to return.

The Air Corps has conducted numerous tests with the Sonic Altimeter and successful results were obtained. In the course of these tests, landings were successfully made by pilots enclosed in covered cockpits and relying entirely upon the device to determine the altitude.

Deliver First of Boeing F4B's to Navy

FIRST delivery on the contract for forty-six Navy F4B-2 single-place fighters was made January 11 to the Navy Department by the Boeing Airplane Company at Bremerton, Wash. The company speeded up production so that the planes can be used in the annual navy maneuvers.

The planes are powered with supercharged Wasp engines of 450 horsepower and are equipped with deck landing gear and flotation bags. These ships are designed to climb to a height of 10,000 feet and return in five minutes. A speed of 350 miles per hour in a vertical power dive has been attained by the F4B-2 in trial flights. High speed in straightaway flight has not been announced.

Naval Planes Make Non-Stop Flight Around Hawaiian Islands

NINE twin-engined patrol planes completed on January 9 a non-stop flight around the entire Hawaiian group of islands in twelve hours, covering a distance of approximately 750 miles.

Commander Victor D. Herbster, chief of the Naval Air Station, Pearl Harbor, commanded the flight which was the longest ever made as part of the training schedule.

The planes were manned by fifty-four officers and enlisted men. Each plane carried three pilots, two mechanics and a radio operator and constant communication throughout the flight was maintained between the planes and the station at Pearl Harbor.

The course of the flight was shaped like a figure eight, the planes passing down the windward coasts, circling Hawaii and returning along the leeward shores to a point north of Makapuu Light on Oahu; and from Oahu northwest, passing around Kauai and Niihau and returning to Pearl Harbor.

Preparations for the flight required several months. Commander Herbster made a complete survey of engineering details and weather conditions. The mechanical details were arranged by Lieutenant M. A. Schur, who accompanied Commander Herbster.



D. B. Colyer, Boeing Vice-President in Charge of Operations, says—

BOEING

"MUST USE THE BEST FUEL AND LUBRICATING OIL THAT CAN BE HAD"... AND DOES!

Stanavo Specification Board, Inc.

Gentlemen:

Boeing Air Transport, Inc., is now operating on the Transcontinental Line between Chicago and San Francisco (Oakland) a total of 40 planes equipped with Pratt & Whitney Wasp and Hornet engines. Included in the above total are twelve Trimotored Boeing Transports used to carry passengers, mail and express.

Under average conditions we fly 7700 miles every twenty four hours; 40% of the total mileage being flown during the hours of darkness. One day's operation calls for a total of forty landings and takeoffs.

Our route takes us over the Laramie, Wasatch and Ruby ranges of the Rocky Mountains and over the Sierra Nevadas. At four points a minimum altitude of eight thousand feet is required to clear the mountain ranges. Frequently it is necessary to fly several thousand feet higher to clear cloud formations resting on the mountain tops.

During the course of a year we encounter practically every weather and temperature condition common to the United States. Ground temperatures range down to forty degrees below zero, in the winter. The heat of Nevada and Utah deserts and the Nebraska plains with temperatures well over one hundred degrees is encountered during the summer months.

Since our Company is a Contractor to the Government for the carriage of United States mail it is necessary that our schedules be operated under adverse conditions that often prevail. Consequently, in addition to dependable planes and engines we must use the best fuel and lubricating oil that can be had. We are now using Stanavo Aviation Engine Oil and Stanavo Gasoline exclusively in our operations. We feel that the high quality of these two products contributes in no small measure to the success of our operation.

Your board is to be complimented upon the progress it is making in the development of fuels and lubricating oils suitable for use in the latest aircraft engines. Your manufacturing and distributing facilities, making these products readily available over our entire line of more than 2000 miles, deserves considerable credit and the thanks of the Aviation Industry in general.

Very truly yours,
BOEING AIR TRANSPORT

D B Colyer

Vice-President in
Charge of Operations



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High-wing cabin Lockheed monoplane built for U. S. Army Air Corps

War Department Awards Contracts for Air Corps Equipment for $1,420,006

SIXTY-THREE airplanes and 128 aircraft engines have been ordered from four aircraft and two engine manufacturers at a total cost of $1,420,006 by the War Department.

Thirty observation planes, Model O-38, and twenty basic training planes, Model BI-2C, were ordered from the Douglas Aircraft Company, Santa Monica, Calif. This order was the largest made for aircraft and involved a total purchasing price of $567,137.

Two contracts for aircraft engines involving $641,883 were awarded to the Pratt and Whitney Aircraft Company, Hartford, Conn. One of these contracts called for fifty-two Wasp engines and the other for sixty Hornet engines.

The Consolidated Aircraft Corporation, Buffalo, N. Y., received a contract for three single-engined air-cooled transports, Model Y1C-22, and spare parts at a total cost of $79,040. Service tests of these small transports will be made to determine their practicability for operation by the Air Corps which plans to acquire a fleet of small and fast transport planes.

Four Stearman primary training planes and spare parts at a cost of $26,756 were ordered from the Stearman Aircraft Corporation of Wichita, Kan.

The Fairchild Airplane Manufacturing Corporation of Farmingdale, L. I., received a contract for $60,500 for six Fairchild photographic planes, each powered with a Pratt & Whitney Wasp SR-1340-D engine. These ships are required to equip photographic sections of the Army Air Corps.

The Wright Aeronautical Corporation, Paterson, N. J., received a contract for sixteen Wright aircraft engines at a total cost of $44,675.

Navy Will Train Reservists in Rigid Lighter-Than-Air Work

TRAINING in lighter-than-air for a limited number of Naval Aviation Reservists will be provided at the Naval Air Station, Lakehurst, N. J., according to a recent announcement of officials of the Bureau of Aeronautics, Navy Department. Final plans for training Reservists in lighter-than-air at this station were not announced.

According to tentative plans, advanced training in the operation of rigid airships will be provided not only to instruct personnel for emergency service in the Naval Air Service, but to build up this phase of aeronautics in the United States. The course of instruction will include engineering phases as well as the operation of rigid airships. Members of the Reserve will be given the same ground school course as Regulars, including the study of aerodynamics and construction and theoretical phases of lighter-than-air craft.

It is pointed out that civilian training in lighter-than-air work with rigid airships can be given only by the Navy Department because the naval airship *Los Angeles* is the only rigid airship in this country.

Students with definite interests in this phase of aviation will be chosen for these Reserve courses and it is preferred that they be engaged in civilian work in this field.

Develop High-Wing Cabin Lockheed Monoplane for Army Air Corps

TESTS of a high-wing cabin Lockheed monoplane will be conducted by pilots of the Army Air Corps at Wright Field, Dayton, Ohio. In tests supervised by the Detroit Aircraft Corporation, builders of the ship, a high speed of 205 miles per hour was attained. With space for a pilot and passenger, the fuel tanks occupy most of the cabin and have a gasoline capacity sufficient for a 2,800-mile flight, placing practically any military base in the United States in reach from a central point within ten hours flying non-stop.

Crissy Field Personnel Complete 3,000 Man Hours in Training Program

THE man hours on tactical and coöperative missions since training at Crissy Field, Calif., started on October 6, 1930, total more than 3,000, according to a recent report of activities at the field. Of this number, 250 hours were flown at night, constituting searchlight tracking and night formations.

The missions consist of coast patrol flying, which extends up and down the coast from Crissy Field for a distance of approximately 200 miles. The planes are equipped with radio and two-way communication is almost continuous during the entire period of each mission.

All of the observation ships on these missions are equipped with cameras to permit the observers to familiarize themselves with the operation of the new types of cameras being produced for the various types of aerial photography. Up to the time of the report of activities, Crissy Field pilots had taken 325 obliques, eighty-five pinpoints, and twenty-three reconnaissance strips.

Lieut. J. C. Upston, Field Operations Officer, is in charge of the course, and thirty officers are in attendance.

Plan to Install Observation Baskets on Naval Dirigibles

"SPY baskets" will be installed on the ZRS-4 and the ZRS-5, the two superdirigibles which the Goodyear-Zeppelin Corporation will construct for the Navy Department, according to tentative plans recently announced. These baskets are suspended beneath the airship in flight to facilitate observation under conditions of poor visibility or to permit the airship to remain concealed by clouds and lower an observer several hundred feet beneath the aircraft.

Plans have been completed for the installation of winches and trap doors in the new airships for the lowering and raising of the baskets. Either hand or power winches will be provided.

Shreveport Presents Field to Air Corps

DEEDS to 23,000 acres of land near Shreveport, La., for use as an Army Air Corps field which, when completed, will cost more than $7,000,000, have been presented to the Secretary of War. The field will be the base of the Third Attack Group, now stationed at Fort Crockett, Texas.

The site is nine miles long and about five miles wide, and cost the city of Shreveport about $1,650,000. It is located within four miles of the city hall, has concrete highways on two sides and can be served by two different railway systems. Active producing gas wells are located on part of the tract, and their output for heating purposes may eventually be made use of for the benefit of the garrison to be stationed there.

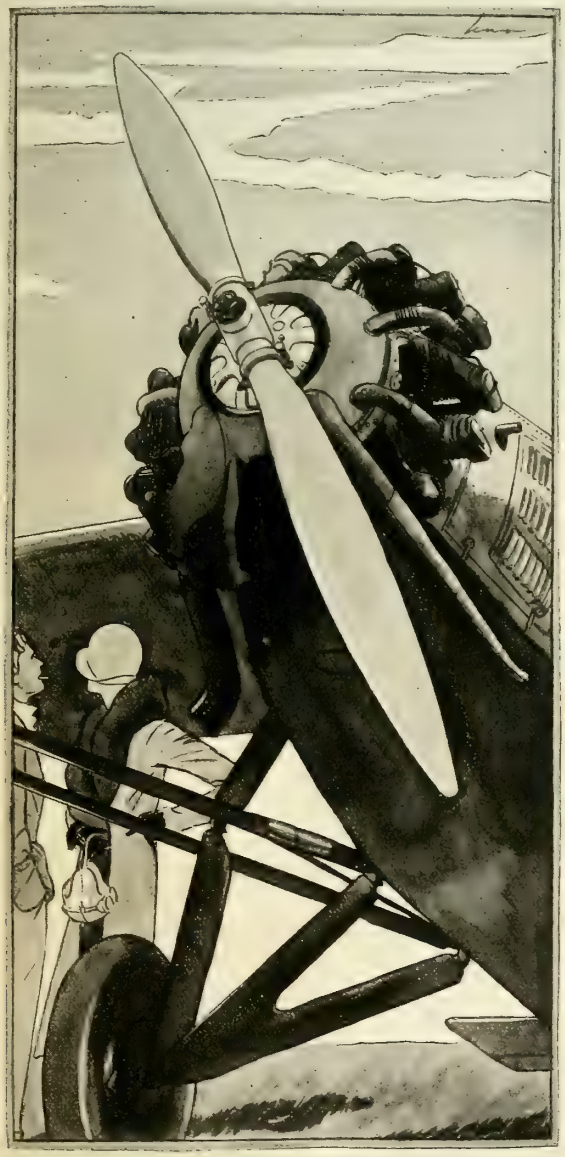
The building program proposed by the War Department calls for the expenditure of more than $7,000,000 at this field.

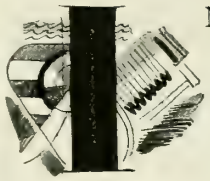
Navy Takes Over Miami Naval Reserve Aviation Base During Miami All-American Air Races

DURING ceremonies held in conjunction with the Miami All-American Air Races, Miami, Fla., January 8-10, the City of Miami turned over to the Navy Department the new Miami Naval Reserve Aviation Base. In order to have the base established in Miami, the city supplied a flying field of 157 acres and constructed a hangar, Commanding Officer's quarters and a recreation building, including space for visiting officers, reading rooms, and space for housing enlisted men on active duty. Miami was selected by the Navy Department as the site in the Southwestern United States offering the best facilities.

Among those who represented the Navy Department in the ceremonies in conjunction with the taking over of the field were the following: David S. Ingalls, Assistant Secretary of the Navy for Aeronautics; Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics; Capt. Hugo W. Osterhaus, Director of Naval Reserves; and Col. Thomas C. Turner, Head of Marine Aviation.

WRIGHT ENGINES BRING MORE POWER TO 1931 PLANES!





IN rigorous service flights during the past two years, Wright has operated "Whirlwind 300's" under conditions that require from thirty to fifty per cent overload!

The "Whirlwind 300" in the Travel Air "Mystery" ship which swept the races at Cleveland and won the world's record for commercial planes, has given continuous and efficient service while delivering over 400 horsepower!

The "Whirlwind" that hurled Frank Hawks' "Texaco 13" across America at 215 m.p.h. and repeatedly at over 250 m.h.p. has performed most satisfactorily while turning out 400 horsepower and more!

That's the kind of performance you get when you fly behind an engine by Wright. Pilots know it by experience. Owners and operators know it by service checks. Passengers know it by smooth, dependable travel.

For the striking improvements that made these flights possible, as well as those in the new "Cyclone 575," choice of Colonel Lindbergh and Lieutenant Al Williams, are constantly being incorporated into regular production Wright engines!

To build one engine that leads one class is one thing. To build engines that fit every flying need, and to keep each engine far in front is another thing. Yet that's what Wright has done for years, and what these constant developments do again for Wright owners of 1931!

WRIGHT

AERONAUTICAL CORPORATION

PATERSON, NEW JERSEY

A DIVISION OF CURTISS-WRIGHT CORPORATION

Langley Field Football Team Completes Successful Season With Several Colleges on Schedule

THE Langley Field football team of 1930 completed one of the most ambitious and successful seasons ever undertaken by a post team of the Army Air Corps. After a successful season in 1929, it was decided to branch out and include a number of colleges in the football schedule for 1930, raising the standard of athletics at Langley Field and gaining recognition among the colleges as a serious football contender. With opposition largely made up of college teams, the Langley Field gridiron outfit played fourteen games, losing five and tying one.

The aggregation was composed of a squad of about forty players. Capt. George L. Usher was head coach with Lieutenants G. G. Lundberg and C. R. MacIver and First Sergeant Steve Stanowich as assistants.

Among the colleges played by the Langley Field team were William and Mary, champions of the Virginia Conference; Campbell, Shenandoah, Atlantic Christian, Potomac State, Gallaudet and Oak Ridge Military Institute. Carlisle Barracks team was defeated 9—0 by Langley Field for the Corps Area championship.

Consider Use of Helium-Oxygen Mixture in Naval Airships

POSSIBILITY of mixing helium with hydrogen for inflation of the two new superdirigibles to increase the gross lift of these two airships is being considered by officers of the Bureau of Aeronautics, Navy Department.

Consideration is being given to the use of a mixture of ninety per cent helium and ten per cent hydrogen, which would make it possible to carry twenty-five additional persons or more than 750 gallons of gasoline. The 90-10 mixture would increase the gross lift about 4,600 pounds over that of pure helium. Such a mixture would become inflammable above this concentration of hydrogen and at fifteen percent, would become explosive.

Chief among the difficulties of utilizing this mixture is the problem of repurification of the combined gases while the airships are in operation. However, recent experiments indicate that this problem can be solved, although a difference of opinion exists about the difficulties involved in the process.

Navy to Experiment With Autogiro

AN Autogiro has been purchased by the Bureau of Aeronautics, Navy Department, for the purpose of determining through tests the practicability of this type of aircraft as an observation and patrol plane in the Naval Air Service, according to a recent announcement of officials of the department.

Army Air Corps and Alabama American Legion Test Plan for Aid in Emergencies

THE practicability of combining forces of the Army Air Corps with posts of the Alabama American Legion to render aid in time of emergency was demonstrated recently by the personnel attached to Maxwell Field, Montgomery, Ala. Under a plan devised by Major Walter R. Weaver and his staff, seven planes covered a total of 2,393 miles and made contact with forty-five strategic centers throughout the state.

The state was divided into seven zones, one plane being detailed to fly over communities in each zone for which messages had been prepared. Outposts in charge of officials of the Legion were arranged at secret locations known only to the pilots and the officials. Each outpost was equipped with a radio sending and receiving apparatus to provide two-way communication between relief and supply planes and the outposts.

Navy Inspects Hawk's Travel Air

AN inspection of the Travel Air Mystery S monoplane in which Capt. Frank Hawks has established several new intercity records was recently made at the Anacostia Naval Air Station by officers of the Bureau of Aeronautics and the Navy Department.

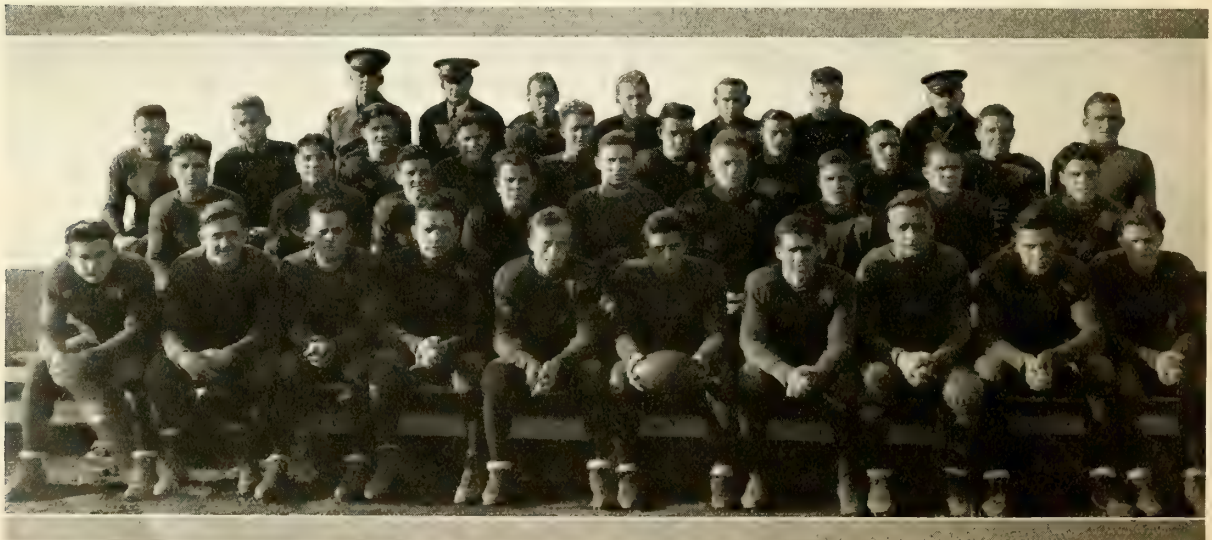
Navy Aircraft Squadron Assigned to South American Survey and Charting

UTILIZING aircraft and surface ships, the U. S. Navy Department has started a hydrographic survey of the coastal waters of Venezuela, according to a recent announcement of Rear Admiral Walter R. Gherardi, hydrographer of the Navy Department. Little data is available concerning hydrographic conditions on the coast and the survey will be made for the purpose of facilitating foreign commerce in this district. Waters surrounding the island of Trinidad, Gulf of Paria and the mouth of the Orinoco River will be surveyed.

The aircraft squadron will be composed of planes of the U. S. Navy Department which recently made an aerial survey of Porto Rico. Following completion of the survey in Venezuela, the aircraft squadron will undertake a coastal survey in the region of the proposed Isthmian canal in Nicaragua.

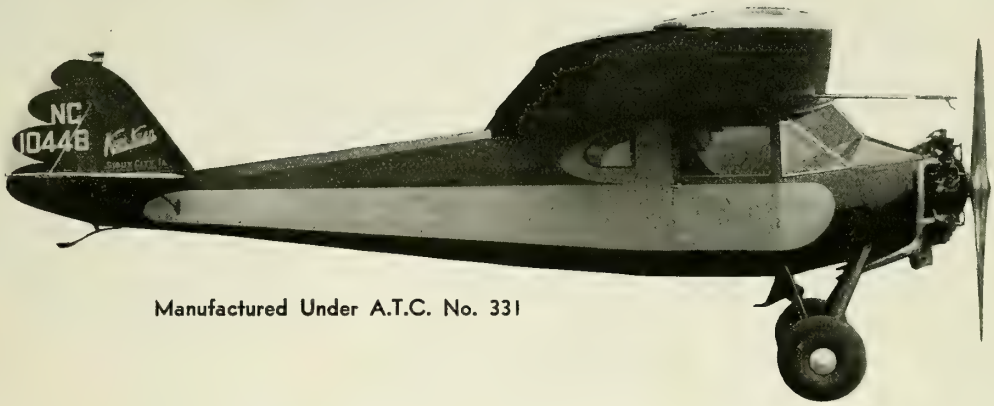
WIND tunnel tests of the seaplanes to be constructed for coastal patrol work by the Coast Guard have been started at New York University. Delivery of the first five of these ships is scheduled for next summer. Model tests were recently conducted at the model ship test basin of the Washington Navy Yard.

DESIGNED to meet certain needs peculiar to the handling of airships, an unwired portable loudspeaker system has been placed in operation at the Naval Air Station, Lakehurst, N. J. The purpose of the system is to provide satisfactory and efficient communication between the crews involved in mooring and handling of large rigid airships on the ground. The two principle phases of the problem which this apparatus is designed to solve are the provision of voice communication between the airship crew and the mooring crew during the landing and mooring operation, and between the mooring officer and the handling crew during ground operations.



Langley Field football team of 1930, Third Corps Area champions who competed against several college teams on hard schedule

THE KARI-KEEN "90"



Manufactured Under A.T.C. No. 331

THE KARI-KEEN "90" is generally accepted as the most practical cabin monoplane designed for the school and private owner. Every desirable feature known to modern aircraft will be found in the KARI-KEEN without a single sacrifice of safety. Abundance of cabin room — the seat is as wide as the one in your car. Open ship visibility. Take-off and landing performance that will please the most critical pilot.

Equipment consists of Type "B" Consolidated Instrument Panel; Air Speed Indicator; Air Wheels and Brakes; Large and Convenient Baggage Space; Special Fahlin Propeller.

Write or wire for further particulars. Some territories available for 1931 to responsible operators.

Fly-away Factory

$3365

SIOUX AIRCRAFT CORPORATION

Successors to KARI-KEEN AIRCRAFT, INC.

SIOUX CITY, IOWA

AERONAUTICAL INDUSTRY

MIAMI ALL-AMERICAN AIR RACES

FOR the third successive year, Miami was the scene of the principal flying meet of the mid-winter season when the Miami All-American Air Races were held at the Miami Municipal Airport, January 8-10. Staged under the auspices of the City of Miami, the three-day period of the races was featured by speed contests and other aerial competitive events for civilian and commercial pilots, and by the dedication of the new Opa-Locka flying field, prepared by the city for the Miami unit of the Naval Aviation Reserve Corps. The field is less than two miles from the municipal airport.

Ceremonies held in conjunction with the presentation of the field to the Navy Department were held January 8 before the start of the race program. Mayor C. H. Reeder made the speech of presentation, and acceptance speeches were made in reply by David S. Ingalls, Assistant Secretary of the Navy for Aeronautics, and by Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics.

Trophies and prizes totaling $7,550 were awarded the winners of the various contests held throughout the period of the races. Three free-for-all speed races, carrying a total of $2,100 in prize money, were included on the program of events, open respectively to planes under 500-cubic-inch displacement; 500 to 1,000 cubic-inch displacement; and unlimited displacement. In addition to other speed races, dead stick landing, bomb dropping, balloon bursting and parachute landing contests were held on each day of the races.

The first event on the program, a dead stick landing contest, was won by Lowell R. Bayles, Springfield, Mass., who landed 5 feet one and one-third inches from the mark. Hugh L. Woods, West Palm Beach, Fla., was second. V. T. Leak, Miami, won first honors in the balloon bursting contest with a time of 30 seconds; Art Davis was second. The first day's bomb dropping contest went to Harold E. Newman, Genesee, Ill., who was 71 feet away from the target. Clarence E. Gray, Lakeland, Fla., took second place.

The first of the airplane speed events on the program, a fifteen-mile race for planes with a cubic-inch displacement of 275 inches, was won by Barton Stevenson with a speed of 108.58 miles per hour. J. W. Smith of Philadelphia was second with 107.16 miles per hour.

John Livingston captured first in the speed race open to cabin planes of 450-cubic-inch displacement or less with 141.58 miles per hour. Second place went to J. W. Smith who covered the fifteen-mile course at 131.29 miles per hour.

Flying a Waco Taperwing, Art Davis, Lansing, Mich., came in first in the free-for-all race of thirty miles open to planes with a displacement of from 500 to 1,000 cubic inches. His speed was 142.91 miles per hour. Arthur W. Killips was second with a speed of 134.485 miles per hour.

R. D. Rae won the parachute event in which a number of contestants jumped from a dirigible flying over the field. Rae landed 26 feet from the mark.

Piloting a Sikorsky S-39, George Meissner won the amphibion race in 33:17:27. Arthur Caperton, flying an Ireland Privateer, was second with 34:01:23. The planes in this contest flew from the airport to a point in Biscayne Bay, picked up a dummy and returned to the field.

Pilots of the Marine Corps and Naval Air Service gave an exhibition of bombing, flying over the field and destroying a miniature city built at one end of the airport. An aerial exhibition was given in the "Gee Bee" Sportster and the "Doodlebug," the ship built for the Guggenheim Safe Aircraft Competition. Three Goodyear blimps competed in a slow race to finish last.

A public demonstration of the Autogiro was given on January 9 by James G. Ray, vice president of the Pitcairn Autogiro Company of America, Inc., who flew the machine from Philadelphia to Miami for the races. The Hialeah Trophy Race, which featured the events on the second day of the races, was won by John H. Livingston with 146.143 miles per hour. Earl Rowland, Dallas, was second.

Tex LaGrone, Kansas City, placed first with a time of 117.57 miles per hour in the fifteen-mile race for planes with a 400-cubic-inch displacement.

William Ong, Kansas City, placed second at 115.884 miles per hour.

In the 500-800-cubic-inch displacement race, E. B. Whilden, Jr., Charlotte, N. C., was awarded first place with a speed of 133.779 miles per hour after Les Bowman, who crossed the finish line first, was disqualified. Art Carnahan of Bloomington.

(*Continued on page* 103)



James G. Ray, vice president of Pitcairn Autogiro Company, arriving at All-American Air Races on flight from Philadelphia

"WINTER KING" FLYING SUITS

1931 MODELS AT SLASHED PRICES

The Premier, most popular WINTER KING flying suit. Completely lined with warm lumberjack wool blanket and interlined with heavy wool felt. For regular flying school work, instruction and passenger flying this is the best suit you can buy for protection against the cold blasts of winter wind. Stylishly cut and tailored to the requirements of aviators. Single breasted.

$24.95

Best quality gabardine, heavily lined with warm wool. 5 inch wombat fur collar, knitted wool wristlets, genuine Talon zippers throughout, patent ring belt.

$18.95

A low priced but warm flying suit that sold as high as $29.50. Single breasted, completely lined with wool felt ¼ inch thick. Ideal for mechanics and students. Zipper equipped; heavy wombat 5 inch collar. This suit is made of same materials and to identical specifications as our $18.95 suit, with the exception of a finer lining of the best virgin wool blanket felt. A warmer and better suit at a low price.

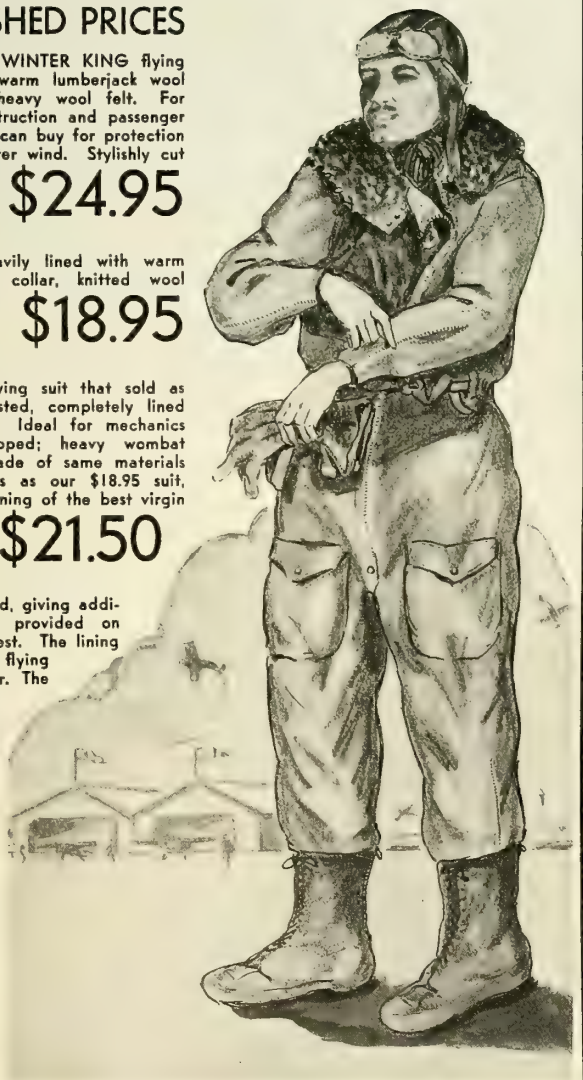
$21.50

This model is double breasted, giving additional warmth. Zippers are provided on sleeves, also leather bib on chest. The lining of long nap wool makes this flying suit ideal for the colder weather. The legs as well as the sleeves are lined with sheep's wool. For service and wear this sheep-lined suit will give you years of comfort.

$35.00

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SMART
WARM
PRACTICAL



FORMFIT HELMETS

Soft leather; lined; powder puffs.

$6.50

Size, please

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AMERICAN TRANSPORT GOGGLES $8.50 to $20.00

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HEAVY WOOL LINED MOCCASINS

Front Zippers,	$8.50
Back Zippers and Front Lacing,	$9.75
Front Snap,	$13.50
Genuine Bass, Back Zippers and Front Lacing,	$15.00

•

WARM GLOVES

Black leather, five fingers, warm wool lined	$3.50
Lambs wool lined, five fingers,	$4.50
Full gauntlet, lambs wool lined, both mitt and five fingers,	$12.95

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Aircraft parts of every description; used motors, etc.

DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

The plant of the Curtiss Aeroplane and Motor Company, Garden City, L. I., will be moved to Buffalo, N. Y., in the early part of 1931, according to an announcement of company officials. (Dec. 26).

As a result of tests of a new device called the "Sonic Altimeter," the Army Air Corps believes it has solved the problem of enabling the pilot of an airplane landing in a dense fog to determine at any given moment his height above ground, the War Department announced. (Dec. 27).

Establishment of a new world's altitude record for women was claimed by Mrs. Juanita Burns following a three-hour flight at Los Angeles, Calif., Mrs. Burns reporting that her plane continued to climb for one-half hour after her altimeter stopped at approximately 26,000 feet. The official world's altitude record for women of 27,418 feet was established March 10, 1930, at Roosevelt Field, L. I., by Miss Elenor Smith. (Dec. 28).

Direct air passenger and mail transport service between New York, N. Y., and Miami, Fla., was inaugurated by Eastern Air Transport, Inc. (Jan. 1).

(Germany.) Fraulein Elly Beinhorn took off from Berlin on a flight to Portuguese Guinea, West Africa, where she will cooperate with an expedition, using her plane to fly over unexplored territory. (Jan. 1).

George R. Hutchinson, Mrs. Blanche Hutchinson and their two small daughters started at Newark Airport, N. J., an aerial tour of the forty-eight states. (Jan. 2).

The second leg of the Precision Tour of the Exchange Clubs of the nation started at Farmingdale, L. I., when Lieut. Walter Hinton took off in a new Fairchild 42 for Charleston, S. C. The tour by Lieutenant Hinton is sponsored by the National Exchange Club as part of its aviation program. (Jan. 3).

A refueling endurance flight was started at Los Angeles, Calif., by Miss Bobby Trout and Miss Edna May Cooper. (Jan. 4).

Reduction of air passenger fares between New York and San Francisco and intermediate stops on the northern transcontinental airway was announced by officials of United Aircraft and Transport whose subsidiaries, National Air Transport and Boeing Air Transport, Inc., operate the 26½-hour run from the Atlantic to the Pacific. The through rate was cut from $259.50 to $227.50 and the rates from the two terminals to the various intermediate stops were reduced. (Jan. 5).

(Algeria.) Three Italian fliers, Lombarde, Mazotti and Rossini landed at Algiers, completing a flight around the entire continent of Africa. The flight started in October at Rome, Italy. (Jan. 6).

(Brazil.) Ten Savoia-Marchetti flying boats of the Italian Air Service under the command of General Italo Balbo, completed at Natal a formation flight of 1,875 miles across the South Atlantic from Bolama, Africa, in 18 hours and 46 minutes. (Jan. 6).

(New Zealand.) A record-breaking flight of 1,200 miles from Australia across the Tasman Sea to Wellington, N. Z., was completed in 12 hours and 15 minutes by Guy Menzies in the *Southern Cross, Jr.*, the plane in which Wing-Commander Charles Kingsford-Smith recently flew from England to Australia. (Jan. 7).

The Third Annual Miami All-American Air Races and Navy Field Dedication were held at the Miami Municipal Airport, Miami, Fla. (Jan. 8-10).

A new world's refueling endurance record for women of 122 hours and 20 minutes was established by Miss Bobbie Trout and Miss Edna May Cooper at Los Angeles, Calif. The former record of 42 hours and 16 minutes was set by Miss Trout and Miss Elenor Smith. (Jan. 9).

The controversy between the Army Air Corps and the Naval Air Service over coast defense was settled by entrusting this function to the Air Corps, although the Navy Department will continue to maintain planes at Coco Solo, C. Z., and Pearl Harbor, Hawaii, where the issue has been presented in concrete form, according to a joint announcement of the War and Navy Departments. The Air Corps will be land-based and the Naval Air Forces will be based with the fleet thus, according to the announcement, "assuring the fleet absolute freedom of action without any responsibility of coast defense." (Jan. 9).

The Second Annual All-Florida Air Tour, held under the auspices of the Florida State Chamber of Commerce, started at the Miami Municipal Airport, Miami, Fla. (Jan. 11).

(Egypt.) The sixth annual formation cruise of the aircraft squadrons of the Royal Air Force of Great Britain stationed in Egypt started at Cairo. The planes will fly to Cape Town, South Africa, and return. (Jan. 12).

(Brazil.) Eleven Savoia-Marchetti flying boats of the Italian Air Service landed at Rio de Janeiro, completing a 747-mile flight from Bahia, the last leg of a 6,250-mile flight which a squadron of fourteen Savoias started December 17 at Orbetello, Italy. (Jan. 15).

Carrying an appropriation of $200,000 for experimental work by the Air Corps in determining the practicability of metal-clad airships, the War Department appropriation bill providing a fund of $460,000,000 for the Department and the Army during the next fiscal year, was passed by the House. (Jan. 15).

(England.) Royal Air Corps pilots will not compete in the Schneider Trophy Race and the British government will give no assistance to any civil entry. The racing seaplanes, with one of which Squadron Leader H.R.D. Waghorn won the trophy last year, will not be made available. Responsibility for the British entry to compete against France and Italy rests on the Royal Aero Club and the aircraft industry. (Jan. 15).

Engineering problems involved in the building and maintenance of a series of seadromes for use of regularly scheduled trans-Atlantic planes were among the subjects of interest to the aeronautical industry presented at the Annual Meeting of the Society of Automotive Engineers, held in the Book-Cadillac Hotel, Detroit, Mich. (Jan. 19-23).

Recommendation that legislation be enacted or regulations adopted to permit economical and efficient construction and maintenance of airport runways and landing fields, was made at a special meeting of the National Highway Traffic Association which was held at the Automobile Club of America, New York, N. Y. (Jan. 21).

The annual meeting of the Aeronautical Chamber of Commerce of America, Inc., was held at New York, N. Y. (Jan. 29).

F. A. I. Recognizes Women's Altitude Record Set by Elinor Smith

HOMOLGATION of the world's altitude record for women of 27,418 feet, established by Miss Elinor Smith, has been made by the Federation Aeronautique Internationale, according to a recent announcement of the National Aeronautic Association. Miss Smith established the record on a flight completed March 10, 1930, at Roosevelt Field, L. I. She used a Wright-powered Bellanca Pacemaker monoplane.

Gildersleeve Executive Vice President and Henderson Managing Director of National Air Races

APPOINTMENT of Clifford W. Henderson as managing director of the National Air Races which will be held at Cleveland, Ohio, for the next ten years, has been announced by L. W. Greve, president of National Air Races of Cleveland, Inc. Mr. Greve also announced the appointment of Clifford Gildersleeve as executive vice president of the National Air Races.

Mr. Henderson managed the National Air Races of 1928, 1929 and 1930, held at Los Angeles, Cleveland and Chicago respectively. Mr. Gildersleeve has resigned as secretary-treasurer and general manager of the United States Air Lines to occupy his new post.

Officers of the National Air Races of Cleveland, Inc., include: L. W. Greve, president; R. B. Robinette, vice president; Alva Bradley, treasurer; and Parker Hill, secretary.

Aeronautical Chamber of Commerce Elects Officers

OFFICERS and governors of the Aeronautical Chamber of Commerce of America, Inc., were elected at the annual meeting of the organization on January 29.

A board of twenty-seven governors was selected, which then elected the officers and executive committee of the Chamber, which will serve for one year. Selection of governors was made by the members from a list recommended by a nominating comittee which had given especial consideration to qualifications, including acquaintances with organization work, sectional interest, geographic location, and affiliation.

The following officers were elected: President, Charles L. Lawrance; vice president, Northeast division, Geoffrey S. Childs; vice president, Southeast division, Thomas B. Doe; vice president, East Central division, Clayton J. Brukner; vice president, North Central division, E. L. Cord; vice president, South Central division, F. G. Coburn; vice president, Northwest division, P. G. Johnson; vice president, Southwest division, Harris M. Hanshue; secretary, John R. Cautley; treasurer, Jerome C. Hunsaker; assistant secretary, Luther K. Bell; and assistant treasurer, Frank J. Walsh.

The executive committee elected is as follows: Graham B. Grosvenor, American Airways, Inc.; J. A. B. Smith, Curtiss Aeroplane & Motor Company, Inc.; Jerome C. Hunsaker, Goodyear-Zeppelin Corporation; Charles L. Lawrance, Lawrance Engineering & Research Corp.; Charles H. Colvin, Pioneer Instrument Company; George S. Wheat, Pratt & Whitney Aircraft Company; Harris M. Hanshue, Transcontinental and Western Air, Inc.

Governors elected are:

Class A—Aircraft and motor manufacturers and transport operators: G. B. Grosvenor, American Airways, Inc.; F. G. Coburn, The Aviation Corporation; R. B. C. Noorduyn, Bellanca Aircraft Corporation; P. G. Johnson, Boeing Air Transport; J. A. B. Smith, Curtiss Aeroplane & Motor Co., Inc.; Edward S. Evans, Detroit Aircraft Corporation; Thomas B. Doe, Eastern Air Transport, Inc.; J. M. Shoonmaker, Jr., Fokker Aircraft Corporation; J. C. Hunsaker, Goodyear-Zeppelin Corporation; George S. Wheat, Pratt & Whitney Aircraft Company; J. T. Trippe, Pan American Airways, Inc.; E. L. Cord, Stinson Aircraft Corporation; H. M. Hanshue, Transcontinental & Western Air, Inc.; C. J. Brukner, Waco Aircraft Company; G. W. Vaughan, Wright Aeronautical Corp.

Class B—Experimental aircraft and engine manufacturers and accessory or material manufacturers having a major interest in aviation: J. R. Cautley, Bendix Brake Company; J. R. Fitzpatrick, Haskelite Manufacturing Corp.; C. L. Lawrance, Lawrance Engineering and Research Corporation; Grover Loening, Grover Loening Company, Inc.; C. H. Colvin, Pioneer Instrument Company.

Class C—Fuels & Lubricants and Insurance: E. E. Aldrin, Standard Oil Company of New Jersey; Reed M. Chambers, U. S. Aviation Underwriters, Inc.

Class D—Aeronautical engineers not engaged in constructing, and accessory or material manufacturers not having a major interest in aviation, and equipment sales organizations: L. H. Merrill, American Gas Accumulator Co.; G. S. Childs, Pitcairn-Cierva Autogiro Co.

Class E—Airports, distributors and dealers, etc.: R. B. Barnitz, Los Angeles Municipal Airport.

Associate: Carl F. Egge, National Air Pilots Association.

Affiliate: L. H. Brittin, Northwest Airways, Inc.

Lieut. Schildhauer Discusses Plans for Flight of Do.X at Aviation Luncheon

PLANS for a trans-Atlantic flight of the Do. X were discussed by Lieut. Clarence H. Schildhauer, co-pilot of the flying boat, at an aviation luncheon given in his honor January 9 by F. W. Lovejoy of the Vacuum Oil Company at the Whitehall Club, New York, N. Y. Lieutenant Schildhauer, formerly of the U. S. Navy, developed the aircraft radio compass used on U. S. Navy patrol planes, the emergency radio power unit and aided in the development of the aircraft bubble sextant.

Lieutenant Schildhauer has sailed for Lisbon where he will rejoin the Do. X in preparation for the trans-Atlantic flight. From Lisbon, the flying boat will fly to the Canary Islands, thence to the Cape Verde Islands where the ship will take off on the 1,230-mile flight across the South Atlantic to Fernando Noronha and thence down the Brazilian Coast to Rio de Janeiro. The Do. X will then fly north and is scheduled to arrive at Miami, Fla., early in March.

FRANK H. RUSSELL has announced his resignation as vice president of the Curtiss-Wright Corporation. Mr. Russell entered aviation in 1909 as the first manager of the Wright Company, Dayton, Ohio. Among his contributions to the aviation industry are the institution of group engineering in the development of new types of airplanes, and the organization of the Manufacturers Aircraft Association to prevent patent litigation.



G. G. Kruesi, in cockpit, who developed with Herbert Hoover, Jr., direction finder using regular radio broadcasts, and Lieut. W. Smith of Army Air Corps

MIAMI AIR RACES

(*Continued from page* 100)

Ill., won second place with 128.183 miles per hour.

George Meissner again won the amphibion race with Art Caperton second. The bomb dropping event was won by Art Chester, Joliet, Ill., who was 16 feet from the target; Art J. Davis was second with 21 feet. A. B. McMullen of Tampa won the dead stick landing contest, placing his ship on the line; and Wesley Raymond was second. H. R. Brinton, Springfield, and H. E. Neumann, Genessee, Ill., tied for first place in the balloon bursting contest. The 200-inch-cubic displacement race of fifteen miles went to V. T. Leak, who averaged 70.408 miles per hour. W. W. Kratz, Cincinnati, placed second with 68.287 miles per hour.

An Army Air Corps bomber gave exhibition flights and the Gee Bee Sportster gave an aerial exhibition. Acrobatics were executed by Freddie Lund. Navy planes performed day bombing maneuvers and formation flights. In the evening a sham battle air raid was staged between dirigibles and bombers and attack planes and anti-aircraft batteries. A miniature city and munitions dump constructed at the airport were destroyed in these maneuvers.

The Fort Lauderdale Trophy Race was held on January 10. Flying a Bird biplane, Frank M. Snyder, Kissimme, Fla., placed first with a speed of 110.54 miles per hour. Dick Stathan, Americus, Ga., was second with a speed of 107.208 miles per hour, flying a Bird biplane.

In the Cincinnati Trophy Race, a free-for-all speed contest open to any type ship, Art Davis, flying a Waco Taperwing, won first place with a speed of 149.369 miles per hour. J. H. Livingston placed second with 147.906 miles per hour.

First place in the 350-cubic-inch displacement race of fifteen miles went to Bart Stevenson who flew a Monocoupe at an average speed of 117.50 miles per hour. F. M. Transue, Alliance, Ohio, placed second, averaging 116.366 miles per hour.

Art Caperton placed first in the amphibion race, winning from George Meissner. The contestants were required to fly to Biscayne Bay and catch a fish before starting back to the field.

The bomb dropping event was won by G. C. Rand of New York who landed h[illegible] sack 43 feet from the target. H. Christ[illegible] son, Jackson, Miss., was second [illegible] feet. Tex La Grone and H[illegible] for first in the dead-[illegible] both pilots [illegible] line.

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PRELIMINARY REPORT OF AIRCRAFT PRODUCTION FROM JANUARY 1 TO DECEMBER 31, 1930

Based on Department of Commerce Licenses, Identifications, Reports

Monoplanes

Open-Cockpit (landplane)	
One place	304
Two place	207
Three place	41
Total open	552
Cabin (landplane)	
One place	3
Two place	112
Three place	28
Four place	257
Five place	9
Six place	63(1)
Seven to ten place	48(2)
Over ten place	28(3)
Total cabin	548
Miscellaneous	
Flying boats	10(4)
Convertibles	11
Amphibions	22(5)
Total monoplanes	1,143

Biplanes

Open Cockpit (landplane)	
One place	33
Two place	346
Three place	561
Five place	7
Total open	947
Cabin (landplane)	
Three place	1
Four place	2
Five place	7
Six place	6
Seven place	2
Eight place	1
Total cabin	19
Miscellaneous	
Flying boats	18
Convertibles	50
Amphibions	58(6)
Total biplanes	1,092
Planes manufactured for experimental purposes for which complete information is not available	29(1)
Military airplane deliveries	710
Airplanes exported	250(7)
Grand Total	3,224

(1) 1 multi-engine plane; (2) 12 multi-... planes; (3) 25 multi-engine planes; ...ti-engine planes; (5) 2 multi-en... (6) 10 multi-engine planse; ...de planes listed in the ...xported dur... prior

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20,000 members and guests of the Exchange Clubs. From the experience gained on the first part of the tour it was decided to use a plane of greater power and one more adaptable to small landing fields.

The Aviation Committee of the National Exchange Club is sponsoring the tour on which Lieutenant Hinton will lecture on aviation to members of the Exchange Clubs throughout the country as part of the Club's aviation program.

Pilots, Aircraft, Mechanics Licensed by Aeronautics Branch Increase

THERE were 15,280 pilots, 7,354 aircraft 8,993 aircraft mechanics licensed by the Aeronautics Branch, Department of Commerce, on January 1, according to a recent announcement of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics. This is in comparison with January 1, 1930, when there were 10,215 licensed pilots, 6,685 licensed aircraft and 7,624 licensed mechanics.

Of the 15,280 persons holding aircraft pilots' licenses at the first of this year, 385 were women, including 35 transport, 50 limited commercial and 297 private pilots. The group of licensed mechanics included five women.

In all, there were 5,792 transport, 1,957 limited commercial, 98 industrial and 7,433 private pilots licensed by the Aeronautics Branch at the first of this year.

Violations of Air Commerce Regulations

VIOLATIONS of the Air Commerce Regulations decreased during the last quarter of 1930, according to a recent announcement of Gilbert G. Budwig, Director of Air Regulation. The Branch dealt with 267 violations during this period, a decrease of eleven over the third quarter. The total number of violations for the calendar year was 844.

Fines totaling $465 were collected from 39 persons during the last quarter. Penalties in the form of 41 reprimands, 47 suspensions, seven revocations and three denials of licenses were imposed.

OPERATING COST OF BELLANCA "AIRBUS"

A DEMONSTRATION tour through New York State, Canada and the Middle West in the Bellanca "Airbus," a single-engined transport plane, was recently completed by Capt. George W. Haldeman, chief pilot of the Bellanca Aircraft Corporation, New Castle, Dela. Twenty-five cities in ten states were visited on the tour which covered 4,418 miles.

Especial interest in the load-carrying ability and performance of the Airbus was expressed by pilots and officials of airlines, who inspected and flew the plane at the various demonstrations given on the tour, according to Bellanca officials.

The expenses of operation over the tour were $355.15, or approximately eight cents per mile, according to a record of all operation expenses on the tour kept by Captain Haldeman for the purpose of obtaining a cost-per-mile figure based on actual cross-country service.

A total of 4,418 cross-country miles on the tour was covered in 35.5 hours at an average cruising speed of 124.5 miles per hour. Gasoline consumed totaled 1,165 gallons, or 33 gallons per hour. At 22 cents per gallon, the cost of gasoline was $256.30.

One gallon of oil per hour was consumed. At 60 cents per gallon, the cost of the oil used on the tour totaled $21.60. One hundred and three man-hours of labor were required for the maintenance, amounting, at 75 cents per hour, to $77.25.

TO commemorate the aeronautic activities of Glenn Curtiss, Chance Vought and Daniel Guggenheim, a meeting will be held February 25 in the Engineering Societies Building, New York, N. Y., sponsored by the American Society of Mechanical Engineers in coöperation with the Aeronautical Chamber of Commerce, the National Aeronautic Association, Society of Automotive Engineers and several other engineering associations.



"Musical Aviators" of Park Central Hotel visited recently by Col. Rickenbacker, "Casey" Jones and Al Williams. These musicians are all airplane pilots

THE TRIANGLE PLANE PARACHUTE

AN airplane was successfuly lowered to the ground from an altitude of 5,000 feet by means of an airplane parachute in tests conducted last fall by the Army Air Corps. A Hoffman Triangle Airplane Parachute, developed by Maj. E. L. Hoffman and made by the Triangle Parachute Company, Cincinnati, Ohio, was used in the experiment.

Carrying two officers of the Air Corps, a Consolidated PT training ship used in the test flight, took off from Wright Field, Dayton, Ohio, and flew to the Fairfield Air Depot where the experiment was successfully completed. The pilot of the ship throttled the engine at an altitude of 5,000 feet and released the parachute which opened within a few seconds. Although the tests were conducted with the utmost secrecy and no official announcement of the results were made, representatives of the press, who observed the experiment, reported that the plane rode beneath the parachute without any pronounced swinging motion and appeared to have a slow rate of descent.

The plane parachute is built on the same principle as the Hoffman Triangle one-man parachute. It is approximately 80 feet from point to point and contains 5,000 square feet of silk cloth. The total weight of the plane 'chute is 125 pounds, or five per cent of the weight of the plane used in the experiment. The 'chute used in the experiment, however, is considerably larger than would be necessary for installation on a plane of the same weight for regular commercial use.

The Hoffman Triangle Airplane Parachute is designed for use on military ships and private and commercial planes. The apparatus is installed in the top wing of the plane and is provided with a rip cord, the handle of which is placed within easy reach of the pilot. In the event of engine failure or damage to the plane which would necessitate a forced landing, the parachute is placed in operation by pulling the rip cord. This releases the small pilot 'chute which draws out the main 'chute, lowering the plane to the ground.

Aronautic Sessions at S. A. E. Meeting

ENGINEERING problems involved in the building and maintenance of a series of seadromes placed 350 miles apart on a line across the Atlantic, were among the discussions of interest to the aviation industry presented at the Annual Meeting of the Society of Automotive Engineers held at the Book-Cadillac Hotel, Detroit, Mich., January 19-23. The problems involved in the establishment of scheduled trans-Atlantic airplane service, using seadromes provided at regular intervals, was discussed by Edward R. Armstrong.

The aircraft session at the annual meeting of the S.A.E., was held on the evening of January 21. C. B. Fritsche, chairman, presided. Mr. Armstrong's paper, "The Economics of Ocean Airways, with Special Reference to the Seadrome System," was presented at this session. The aircraft engine session, C. L. Lawrance, chairman, was held on the morning of January 22. Papers presented included, "Fuel Injection with Spark Ignition in an Otto Cycle Engine," by G. L. Williams, E. S. Taylor, and C. F. Taylor, Massachusetts Institute of Technology; and "Increasing the Thrust Horsepower of Radial Air-Cooled Engines," by P. B. Taylor, Wright Aeronautical Corporation.

At an informal discussion held on the morning of January 21, a paper, "Some Observations in the Detonation Testing of Aviation Fuel at High Temperatures," was read by D. P. Barnard, Standard Oil Company of Indiana.

Demonstration Tour of Autogiro

A DEMONSTRATION tour of the most recent American model of the Pitcairn-Cierva Autogiro of cities along the Atlantic Seaboard was scheduled to start at Miami, Fla., following the Miami All-American Air Races, held January 8-10. James G. Ray, operations manager of Pitcairn Aviation, Inc., will pilot the Autogiro on the demonstration tour.

The machine which he will use is a three-place open-cockpit model powered with a 300-horsepower Wright Whirlwind engine. It has a high speed of 125 miles per hour. A similar model, piloted by C. J. Faulkner, is scheduled to make a tour from Philadelphia to the West Coast to establish points for the commercial distribution of Autogiros.

COMING AERONAUTICAL EVENTS

January 29. Annual meeting of the Aeronautical Chamber of Commerce, New York, N. Y.

February 1. Finish of the Second Annual All-Florida Air Tour, scheduled at Tampa.

February 1-20. First Pan-American Aeronautical Conference, Montevideo, Uruguay.

March 25-27. Third National Airport Conference, Mayo Hotel, Tulsa, Okla.

April 11-19. International Aircraft Show, Detroit, Mich., sponsored by Aeronautical Chamber of Commerce and Aircraft Bureau, Detroit Board of Commerce.

May 15-31. International Aero Exhibition, Stockholm, Sweden.

May. Annual maneuvers of Army Air Corps along Atlantic Seaboard.

June. First Annual Aviation Country Clubs Seaplane Cruise, sponsored by Amateur Pilots Association, on Atlantic Coast.

August 23-Sept. 1. Tentative date of National Air Races, Cleveland, Ohio.

To Study Uses of Mohair in Aircraft

USES of mohair for airplane seats and the interior of airplane passenger cabins will be studied by the Mohair Institute which has been established at Chicago, Ill., under the directorship of A. C. Gage. The institute will conduct research in the improvement of the quality of mohair and in the development of new uses for this material, especially in the aircraft industry.

Monocoupe Licensed as Seaplane

THE Monocoupe, powered with a 90-horsepower Lambert engine and fitted with Edo Model 1525 floats, was recently licensed as a seaplane.

Preliminary tests at the Edo Aircraft Corporation Seaplane Base in College Point were unofficially conducted by D. A. Luscombe of Mono Aircraft Corporation and G. B. Post of Edo Aircraft Corporation. Final tests and the awarding of the Approved Type Certificates were made at Moline, Illinois.

The Monocoupe is the smallest closed type seaplane on the market. It has a weight empty of less than 1,000 pounds and in test flights carried a useful load of approximately 600 pounds, made up of two people, fuel and oil, anchor, and baggage.

NEW YORK

ARCHIBALD BLACK has resigned as president of Black & Bigelow, Inc., air transport engineers, New York, N. Y. He will remain available as consulting engineer. A. A. Bigelow, formerly vice president, has succeeded Mr. Black as president. The name of the company has been changed to A. A. Bigelow & Company, Inc.

G. S. IRELAND has been appointed sales manager of the American Aeronautical Corporation, Port Washington, L. I., according to a recent announcement of Enea Bossi, president of the company. Mr. Ireland has been affiliated with the aircraft industry since 1916. Mr. Bossi announced that the American company plans to produce a small amphibion, similar to the Savoia-Marchetti S-56.

AN exhibit of aviation paintings, photographs and old prints is being held under the joint auspices of the New York *Times* and G. P. Putnam's Sons in the Putnam Building, New York, N. Y. It is planned to continue the exhibition throughout the month of February. Exhibits include the work of Clayton Knight, Anton Widlicka, F. K. Thornburg, F. A. A. Dahme, William Heaslip and Wayne Davis; photographs and maps of Admiral Byrd's

(*Continued on next page*)

(New York News Continued)

expedition to the South Pole; and small model planes of the manufacturing divisions of United Aircraft and Transport Corporation.

AN evening course in aerodynamics and airplane structures has been inaugurated by the department of mechanical engineering of the Polytechnic Institute. The course is designed for technically trained students interested in airplane design.

A SHOP for the retail sale of model airplanes and accessories has been opened at Hempstead, L. I., by the Broadfield Aeroplane Co., Inc., model airplane manufacturers. Complete line of Broadfield model planes, construction kits and model airplane supplies for building experimental models will be distributed.

AIR Associates, Inc., New York and Chicago, reports the final liquidation of its airplane inventory in accordance with its decision announced last year to concentrate upon the distribution of accessories and supplies, and the repair and overhaul of airplanes and aircraft engines. The last two sales completing the liquidation were of Warner-powered General Aristocrats.

A TWO-PLACE biplane flying boat powered with a 32-horsepower water-cooled outboard motor driving a pusher type propeller, and designed to operate on three gallons of gasoline per hour, has been constructed by Henry T. Booth of Freeport, L. I. The engine bed is installed in the hull of the ship. A shaft leads from the motor to the propeller which is situated directly behind the wings. The hull is of metal. Small pontoons are installed at each end of the lower wing.

The ship has a wing spread of 28 feet and a length of 20 feet. High speed is 75 miles per hour.

AN order from the Army Air Corps, Materiel Division, Wright Field, Dayton, Ohio, for six Fairchild 71 photographic planes has been received by the Fairchild Airplane Manufacturing Corporation, Farmingdale, L. I. Special equipment for each ship includes two Fairchild aerial cameras, one for vertical and one for oblique work.

CENTRAL NEW YORK

[M. MARVIN]

A GROUND school class was recently organized at the Utica Airport, Utica. The group is known as the Utica Free Academy Night School Aviation Class and has a membership of forty-eight. Classes are held every Monday evening. Reginald L. Heath is instructor.

IMPROVEMENTS recently made at the Utica Airport include the installation of boundary lights at the west end of the airport and a new heating unit in one of the hangars, and extension of the field approximately 1,000 feet.

[E. P. SARLES]

THE Hudson Valley Flying Club, recently organized with headquarters at the Tri-States Airport, Montgomery, has been active throughout the winter. There are ten members paid up and five paying their initial fee on installments. In two months the club has produced one private pilot and two ready to take tests for the private license with the remainder well on the way to solo. Noel Clark is instructor.

Rates of $9 per hour for dual instruction and $6 per hour for solo flying is charged. Expenses of operation have been figured so that $2 for every hour of flying goes into the treasury over and above costs. A Waco 10 powered with an OX-5 engine and equipped with Airwheels is used for flying instruction and solo work by members. It is planned to purchase in the spring a ship powered with an air-cooled engine.

[L. EPSTEIN]

DEPARTMENT of Commerce non-commercial glider pilots' licenses were recently awarded to six members of the newly organized Arnot Gliding and Soaring Club of Elmira, N. Y. Four of the six recipients of this license had secured their National Aeronautic Association third class glider pilot's license two weeks previously. Each applicant for these licenses has had an average of only thirty-five flights.

The Arnot Club will affiliate with the National Glider Association and coöperate with that organization in promoting gliding and soaring. An effort to popularize gliding locally will be made by awarding trophies to members of the club for distinguished glider achievement.

Government Orders Smith Parachutes

THE Aeronautics Branch of the Department of Commerce has contracted with the Floyd Smith Safety Chute Company, Buffalo, N. Y., for six parachutes at a total cost of $1,050. These parachutes will be for the use of personnel of the Airways Division of the Aeronautics Branch.

MAINE

[F. E. FLETCHER]

THE Auburn Glider Club, formed during the past summer, is anticipating a busy winter season as they plan to use their Alexander primary glider on the frozen surfaces of lakes near Auburn.

The club has eighteen members. The officers are: president, Donald Dean; vice president, Hector Creamer; and secretary and treasurer, Gerald Dillingham.

LANS for the development of an airport have been made at Waterville and Calais.

A SURVEY of airport conditions was recently made by Charles N. Cutter to determine the practicability of establishing an airline in this state.

NEW JERSEY

A NEW type of harness has been designed by the Switlik Parachute and Equipment Company, Trenton, N. J. The leg and breast strap of the harness may be adjusted as one, bringing the load evenly on the entire body when the parachute opens. Webbing of pure purged linen and of a twill weave is used.

CHARLES H. DAY has announced his resignation as president, chief engineer and director of the New Standard Aircraft Corporation, Paterson, N. J. Mr. Day will inaugurate an engineering consulting ser-



Flying boat with all-metal hull and powered with a 32-horsepower engine driving a pusher type propeller

vice within the near future, probably in New York. Formation of a staff of engineers, technical experts and draftsmen has been started.

[F. L. FITZPATRICK]

PERSONNEL changes were made at Central Airport during the past month. Sterling R. Smith has been appointed field manager for Eastern Air Transport. He takes the place of G. J. MacDonald, who became co-pilot of a twenty-passenger Condor flying between New York and Washington. John J. Stevenson was transferred from pilot to the sales department of the Ludington organization for the winter. Bill Eaton, former chief of the Central ground force, is now a dispatcher for the Ludington Lines. In his place is Jack Sullivan. William B. Briggs, dispatcher, went to Baltimore to arrange for Ludington planes making hourly stops there. Another inspector will be added to the office of Chester A. Charles, Department of Commerce supervisor at Central.

MARYLAND

[E. W. WALSH]

FORTY-SEVEN acres will be added to the flying surface of Logan Field with the completion of improvements now under way, which involves the moving of 35,000 cubic yards of material, according to a recent announcement of Charles F. Goob, chief engineer of Baltimore. Runways will be approximately 2,800 feet long and 300 feet wide. Revolving beacons will be installed at a cost of $1,400.

WORK on a new series of biplane flying boats for the Navy Department under a contract which calls for twenty-eight of these ships has been started by the Glenn L. Martin Company, Baltimore. The first plane is scheduled for completion about March 15. Approximately 1,500 men are at work in the Martin company's plant on the construction of planes called for under various contracts.

PENNSYLVANIA

RAYCROFT WALSH has been elected president of the Hamilton Standard Propeller Corporation, Homestead, Pa. He succeeds E. E. Wilson, formerly president, who is also president of the Sikorsky Aviation Corporation, resigned to devote himself more actively to the Sikorsky company.

PHILADELPHIA

[R. GARD]

THE City of Philadelphia recently assumed full ownership of Hog Island and of all the buildings, once part of the shipbuilding plant, left on the site. Preparations have been made for the letting of contracts for grading the tract preliminary to construction of the air-rail-marine terminal.

The development, including the razing of buildings and piers, is expected to cost nearly $500,000. The city has this money available from loan funds, and the Mayor recently placed unemployed men to work on the job under the direct supervision of the Public Works Department.

A NEW teletype weather reporting system was placed in operation recently by the Lighthouse Division of the Department of Commerce, between Pittsburgh and New York, with stations at approximately thirty-mile intervals across Pennsylvania and New Jersey.

Flying information will be available for pilots of the Philadelphia district through Central Airport, Camden, from the entire Eastern part of the country.

The new circuit will furnish reports from Chicago and St. Louis to New York, with special attention to Western Pennsylvania.

OHIO

AUGMENTING the school building and general office at the Municipal Airport, Springfield, Ohio, the Little Greiner Flying Service, Inc.. has constructed a pilots' club room, provided with individual lockers, radio and telephone service. There are approximately twenty active ground school students and ten flying students enrolled in the school. In addition to the school, the company operates passenger sightseeing and aerial photography services, and distributes aircraft.

[T. E. LUNSFORD]

L. H. PECK was elected president of the Cleveland Aviation Club at a recent meeting. Other officers elected were Maj. Lyman R. Walker, first vice president; F. H. Boyd, second vice president; John Bloss, secretary and treasurer, and Maj. A. W. Harris, Maj. M. J. McQuilkin, Lynn Ranney and E. R. Frost, directors. The club will hold its twelfth annual ball February 14.

INCORPORATION papers have been issued to the Aviation Advancement Company of Cleveland. The company is capitaiized at $50,000. The incorporators are Glenn Offenbacher, F. S. Whitcomb and Katheryn T. Wright.

INCORPORATION papers have been issued by the Secretary of State to the Erie Isles Air Ways Co., Inc. The company has an authorized capital of $80,000. The incorporators are R. N. Anderson, Milton Hersberger, Thelma Hersberger and William Kinzler. The company is located at Put-in-Bay.

OPERATING control of air mail and passenger lines of the Embry-Riddle Company, flying between Cincinnati and Chicago, and Continental Air Lines, air mail contractors between Cleveland and Louisville, have been consolidated under the management of John P. Riddle, vice president of the Embry-Riddle. Both companies are subsidiaries of Aviation Corporation, parent company of American Airways.

INCORPORATION papers have been issued by the Secretary of State to the Ashland Airport, Inc., Ashland, Ohio. The company is capitalized at $25,000. The incorporators are George P. Riebel, J. Howard Pry and E. P. Helbert.

COLUMBUS

[W. DONALD WALTER]

GOVERNOR WHITE has appointed Frank M. McKee Director of Aeronautics, State of Ohio, to succeed John M. Vorys. Mr. McKee has a long service record, beginning with his enlistment in the Navy twenty years ago. At the outbreak of the war, he enlisted in the Aviation Section, Signal Reserve Corps, and was commissioned in 1918, subsequently serving with various lighter-than-air outfits in this country and overseas. Remaining in the service after the war, he took his heavier-than-air training, and was one of the first Air Corps officers to hold both balloon and airplane pilot's ratings. He came to Columbus several years ago from Scott Field, being detailed to take command of Norton Field, where he immediately proceeded to make a real Reserve field.

After his resignation from the Air Corps in 1929, Mr. McKee was appointed manager of the local base of Curtiss Flying Service, Inc., in which capacity he served until the fall of 1930.

A POSTOFFICE sub-station is to be established in the administration building at Port Columbus. It is expected that this will greatly facilitate the handling of the air mail in and out of this station, as the mail has been heavy since the inauguration of the Transcontinental and Western Air, Inc., route.

RESERVE officers at Norton Field are rejoicing over the long-anticipated arrival of an 02H for their use. Those pilots who have been checked out on it by Lieutenant McConnell are enthusiastic over the performance of this ship. Another similar ship is expected soon.

MICHIGAN

ADOPTION of the Continental Model A40 engine of 35-horsepower as the standard power plant of the Huntington "Chum," manufactured by the Huntington Aircraft Corporation, Stratford, Conn., has been announced by Willis Brown, sales director of the Continental Aircraft Engine Company, Detroit, Mich.

New Training Methods Adopted by U. of M. Glider Section

THE Glider Section of the University of Michigan Aeronautical Society, after four years' experience in training glider pilots, has this year introduced several changes in its methods that are proving unusually successful. The membership this year has been limited to fifty-five, a reduction over last year's roster effected by strict entrance requirements.

The section is now training by the auto-towing method in a Franklin Secondary glider, with the result that the ship has had more than 400 hours of flying since the end of October without a crack-up.

(Continued on next page)

(*Michigan News Continued*)

During the winter the organization will use a lake near Ann Arbor where the gliders have the advantage of a straightaway of nearly two miles against the prevailing winds. The members have done some elementary soaring in the hills around the lake.

SUBSEQUENT to the description of the Lenert Model C all-metal biplane which was published in the November, 1930, issue of AERO DIGEST, several changes have been incorporated in construction. The Lenert Model C is now being built as a three-place instead of a two-place ship as previously announced; the gasoline capacity has been increased from 51 gallons to 61 gallons; and 8.50 balloon tires are provided. High speed is 125 miles per hour; cruising speed, 110 miles per hour; landing speed, 30 miles per hour; and cruising radius, 500 miles.

The Lenert Model C biplane is built by the Lenert Aircraft Company, Pentwater, Mich.

[J. M. HILL]

REPEAL of all existing air laws of Michigan, which deal with regulation of airports, aircraft, flying schools, and intra-state flying activities, and substitution of a uniform law to cover the scope of present scattered legislation while at the same time incorporating certain changes and improvements in the laws, is the undertaktaking of the Michigan State Board of Aeronautics as outlined recently by the Board's director, Maj. Floyd Evans.

The accomplishment of this revision would mean that six major air laws would be replaced by the one uniform law. The new legislation would not, however, touch upon the matter of state ownership of airports or the state's participation in financing municipal or county flying fields, or such similar subjects. There are at present laws covering airport development and improvement, but alleged conflict with a clause in the state constitution has prevented their being made effective.

There are at present 600 students registered in flying schools in Michigan, Major Evans said. During the past year students were given a total of 14,000 hours of ground school instruction, together with 5,000 hours of dual time, and 6,000 hours of solo flying. A total of more than 2,000,000 miles was flown in the state by air students in 1930.

The board has issued permanent licenses to thirty-four airports, seventeen flying schools, and fifty-three ground and flight instructors, and temporary licenses to twenty-seven airports, twenty airport managers, sixteen schools, and forty ground and flight instructors.

WISCONSIN

[W. SCOLLARD]

THE Hamilton Metalplane division of the Boeing Airplane Company, has moved from its former quarters and is installed in its new hangar at the Milwaukee County Airport. The company will continue to service Hamilton planes and Hamilton-Standard propellers.

JOHN B. KOHLER, pesident of the Kohler Aviation Corporation, Milwaukee, is seeking additional financial backing of approximately $250,000 to extend the present service. It is planned to establish round trip service direct from Milwaukee to Detroit, planes making two round trips daily, and also night air express service between the two cities. This would supplement the present passenger and express air service between Grand Rapids, Mich. and Milwaukee.

CHEAPER rent for housing small planes at the Milwaukee County Airport has been authorized by the county board's highway committee. Reductions authorized at the request of William F. Cavanaugh, highway commissioner, cut rent for planes occupying 750 square feet or less to $25 a month until the new steel hangars are ready. The lowest rent heretofore has been $40 a month.

OKLAHOMA

THE present staff of the Garland School of Aeronautics, Tulsa, according to a recent announcement, is as follows: Lieut. J. A. Reece, general manager, 6,500 hours; J. Armstrong, chief pilot, 3,300 hours; W. Jessup, chief mechanic, 75 hours; W. Krebs, first assistant mechanic, 254 hours; and W. Watkins, H. Jenkins, B. Myers and H. Jackson, mechanical staff.

IOWA

[R. W. MOORHEAD]

PLANS are underway for a statewide organization of the National Aeronautic Association in Iowa, according to a recent announcement of E. O'Dea, governor of the association for Iowa. As the first step in the formation, Mr. O'Dea recently called a meeting of more than one hundred business men and others interested in aviation. Similar meetings will be held throughout the state.

Plans will be discussed for increasing the membership of the Des Moines chapter, promoting aviation activities in the state and city and encouraging greater use of established airlines.

The membership committee of the Des Moines chapter of the N.A.A. is comprised of Harry Monson, Paul Groom, Guy Young, W. H. Millhaem, Charles Gatschet, Bob Eaton, Russell Reel, Clyde Minnis, Kenneth Henkle, Sus Whiting, Fred Keating, John Shuler, Ralph Penn, Guy Brunk and F. C. Anderson.

FLYING activities at the Des Moines Municipal Airport during 1930 continued practically on a par with 1929, and present indications point to increased activities during 1931, W. H. Millhaem, manager of Yellow Cab Airways, Inc., stated recently in announcing the annual report of the company. The aerial survey department of the company showed an increase of eighty per cent in business for the year. Nine ships operated by the company flew a total of approximately 150,000 miles, carrying 4,744 passengers. During the three and one-half years in which the company has been in operation, its planes have transported a total of 19,542 passengers.

NEBRASKA

[J. R. LOWELL]

A RECENTLY completed audit for 1930, the first fiscal year that the Lincoln Flying School has operated since incorporation, shows a very satisfactory year for the organization. Starting as a corporation in the fall of 1929 with three Lincoln-Page training ships valued at $7,000, the company at the end of the first fiscal year had eight planes in operation, purchased at a cost of $23,000. These include a six-place Travel Air monoplane, two-place Kari-Keen monoplane, three-place Barling, an American Eagle biplane and four Lincoln PT's. During the year, 261 students, representing forty-one states and five foreign countries, were enrolled for flying and ground courses. The school has been placed on the list of Government approved schools.

THE Arrow Aircraft & Motors Corporation has established its first dealership on the Southern Atlantic seaboard. The Miami Aero Club has taken over the sales franchise for the State of Florida and has accepted delivery on a new Arrow Sport Trainer, which will be used both as a training ship for club members and as a demonstrator.

OMAHA

COMMISSIONER DEAN NOYES, manager of the Omaha Municipal Airport, has announced that an administration building will be erected early in 1931. As soon as this is completed all activities will be conducted from the field and not from the city hall, as has been done in the past. Commissioner Noyes reported that total annual payrolls of over $219,000 are now maintained by companies operating from the field.

During 1930 there was an average of 1,109 passengers a month departing from this airport. Eighteen passenger planes are daily leaving the port. There are seventy-five students now taking courses in piloting from the Mid-West Aviation Company and the Rapid Air Lines.

Omaha recently voted $500,000 for further improvement of the port.

MISSOURI

THE Lightplane and Supply Company has been organized at St. Louis, Mo., for the manufacture and distribution of parts and accessories for light aircraft. The company was formed by a group, including J. E. Hanger, chief engineer of Cleone Motors, with which organization it is in no way affiliated except as sales agents. The company has developed the Cleone Parquet, a light plane powered with a Cleone engine. All the metal parts of this ship are of heat treated duralumin. The plane will be sold unassembled as an entire set of twelve parts, which may be obtained singly if desired, or flyaway. In addition, parts and blue prints will be carried in stock.

[M. SHEETZ]

THE Kansas City Municipal Airport had a large volume of business during 1930, according to the report of Roy C. Farrell, airport manager. A total of 45,987 passengers arrived and departed from the airport during the year, transport planes carrying 32,636 passengers. More than fifty-three tons of mail were handled, exclusive of freight and express shipments. The largest amount of air mail to be handled in a single day was on December 23 when 1,500 pounds came into Kansas City and 1,560 pounds were sent out. A total of 1,488 transient planes used the airport.

MISSOURI VALLEY AIRLINES has started operations at Rosecrans Field, St. Joseph, handling freight and passenger business. The company is incorporated for 50 years, with a capitalization of $50,000. The stockholders are: W. A. Masters, John P. Davidson, Mary M. Masters, Frank Bettis, Katharine Masters and A. G. McCaughan.

ST. LOUIS

[T. P. WAGNER]

WORK on the new Naval Reserve hangar, to cost $57,933, will be started at Lambert-St. Louis Field immediately. The hangar will be built from municipal airport funds. The Navy will supply the planes, machinery, and other equipment, valued at $250,000, and will spend $47,000 annually for payrolls and operating expenses.

Lieutenant Weld will enroll college students who desire to apply for the Navy's aviation course, including a year with the fleet. Twelve or fifteen students will be selected for the course from the applicants.

THE Curtiss-Wright Airplane Company, Lambert-St. Louis Field, is completing the manufacture of twelve Kingbird transport planes, costing $250,000, for Eastern Air Transport, Inc.

The ships, which have radio equipment, are powered with two 300-horsepower Wright engines and accommodate six passengers, two pilots, and mail. The planes will be used in regular service between New York, Washington, and Florida. The personnel of the Curtiss-Wright factory was increased by 200 men to turn out the order.

When the Eastern Air Transport order is completed, a similar ship will be built for the United States Marine Corps for transport and ambulance service.

TEXAS

A STEARMAN biplane powered with a Wright J-5 engine is being used by Jay Taylor, district superintendent covering the cementing operations of Kansas, New Mexico and Texas for the Halliburton Oil Well Cementing Company. The use of the plane has increased his ability to cover his territory by approximately seventy-five per cent.

[C. MORRIS]

MANAGEMENT of the Gifford Flying Service at the Beaumont municipal airport has been assumed by Frank Estill and R. W. Sanford.

AN airway ticket office has been opened in Hangar No. 1 at Love Field to be used as a clearing house for air transport information and for the sale of air transportation tickets.

A DRAINAGE system costing $18,000 is under construction at Love Field, Dallas, as a result of specifications made by National Air Transport. As soon as this improvement has been completed a $75,000 hangar and administration building will be constructed by N. A. T.

The size of the field has been increased by 780 feet as a result of the purchase of land adjoining the field.

THE San Antonio Flying Club has been organized at Winburn Field, the municipal port at San Antonio, and has purchased an American Eagle plane. As the club expands units of fifteen members will be assigned to a ship for flying instruction.

FRANCES and BASIL RUST have announced the establishment of a commercial air transport company in Galveston. They plan to operate a service between Galveston and Freeport.

MANUFACTURE of airplane motors by the Everetts Aerial Corporation of Austin, is scheduled to begin in the near future. The motor was designed by Walter Everetts of San Antonio. Austin business men who chartered the corporation are George Wicker, Arthur Watson, Landon Bradfield, Harris Brush, and Bob L. Lyles. Capital stock of the company is $7,500. Alex Valance will serve as corporation engineer.

ALABAMA

[O. G. JONES]

STATE Attorney General Charles C. McCall has ruled that the four-cent-per-gallon state gas tax must be collected at Maxwell Field, the Air Corps field at Montgomery. The companies distributing gasoline at the field must pay the tax and the field is not exempt from this tax even though controlled by the Federal Government.

CONTRACT for the construction of an administration building and hangar at the municipal airport being developed at Birmingham has been awarded the Honeycutt Construction Company for $88,834. The administration building will cost $53,141 and the hangar, $35,363.

WHEN a hard surface runway is completed at the municipal field under construction, Birmingham will be made a stop on the Southern Transcontinental air mail line operated by Southern Air Fast Express. Jerry Marshall, operations manager of the company, has been assured by city officials that work will be rushed toward the completion of a runway to serve temporarily until the field is developed.

FLORIDA

[J. M. MURRAY]

ANNOUNCEMENT of plans for the construction of an airport with an exposition building for aircraft was made January 10 by Henry L. Pierce, trustee and vice president of the International Aeronautical Industries, a trust estate, which has as affiliated organizations the following companies: All-American Airways, Inc.; Safety Aircraft; Miami Motor Glider Corporation; and a company being organized to control and operate the exposition building.

The structure for the exhibition of aeronautical products, according to Mr. Pierce, will comprise a main section which will be two or more stories in height and 550 feet in length; and two wings, each having a length of 650 feet. The cost of construction will be approximately $650,000. Plans have been prepared by Charles P. Nieder, architect of Miami.

Mr. Pierce said that the company plans to build a new hangar at the All-American Airport and has installed an electric lighting system. The field is east of the municipal airport and is three-fourths of a mile square.

B. C. SKINNER has been elected president of the Florida State Aeronautical Association, succeding E. R. Bentley, resigned. Other officers elected were: A. H. Heermance, Miami, secretary; Jerome Waterman, Tampa, treasurer; Dr. Ralph Greene, Jacksonville, vice president; Frank Ladd, Key West, vice president; and C. L. Waller, Tallahassee, vice president.

CONTACTS

By FRANK E. SAMUELS

WHILE on a recent trip we made a call at both the T. Claude Ryan Flying School and the Airtech School of Aviation in San Diego. Mr. Ryan at the Ryan School and Doug Kelly at Airtech reported a continuous improvement in their student instruction business.

PACIFIC Technical University at San Diego, working in conjunction with the T. Claude Ryan Flying School, is engaged in experimental work on an oil pump for airplanes and on a Diesel engine.

CRAWFORD AIRPLANE COMPANY at Seal Beach report that the structural tests of the Department of Commerce tests have been passed by their powered glider and that they are now awaiting the flying test for an Approved Type Certificate.

BRUCE BRAUN, manager of the Stinson-California Company, United Airport, Burbank, announces the inauguration of sightseeing and charter trips. Stinson Jr., cabin planes will be used. R. C. Wil-

(*Continued on next page*)



Douglas commercial amphibion powered with two 300-horsepower Wright engines

(*Contacts Continued*)

liamson, formerly with Tanner Air Livery, will be in charge and rates to all parts of the country have been established on the basis of mileage cost of operation. Williamson states that on trips of more than one day no extra charge will be made for stopovers.

UNITED AIRPORT, Burbank, announces the opening of an air travel ticket office and information bureau. For this purpose they have constructed an office in the main lobby of the administration building. A twenty-four-hour service will be given.

WESTERN UNION TELEGRAPH COMPANY has established a branch office at the United Airport, Burbank, for use by air travelers wishing to telegraph direct from the airport. Complete Western Union tele-type weather information equipment has been installed and pilots are able to obtain complete weather data at all times.

CALIFORNIA

"IN recognition of the exceptional services rendered the public," Charles V. Frith, pilot of Transcontinental & Western Air, Inc., has been decorated by the Nicaraguan government. The citation refers specifically to his activities during battle maneuvers on October 16, 1929, as a staff sergeant aviator in the United States Marine Corps engaged against the rebels under General Sandino.

APPOINTMENTS of H. A. Burgess as general traffic manager of Western Air Express and Midcontinent Air Express, and Charles F. McManus as general traffic manager, were announced recently by Harris M. Hanshue, president and general manager.

Napa Glider Club Active

A DEVICE which permits the pilot of a gilder to release the machine on the take-off is utilized by members of the Napa Gilder Club, Napa, Calif. The shock cord method of launching has been adopted, four men pulling the cord and a fifth steadying the wing tips. The glider is attached to a tail release which is fastened to the ground. The pilot trips the release from his seat by means of a rope connected to the trigger. The take-off is facilitated by means of a greased skid which may be moved into the wind. An automobile is used to tow the glider to the point of take-off. Seven members of the club completed during December forty-seven short flights of from seventy to 220 yards.

ALAMEDA

[H. V. WALDORF]

MONTE SHARP, pilot of Air Ferries, Ltd., transported 16,000 passengers on the Oakland-San Francisco service during the period from February 1 to November 1, 1930, completing 2,800 trips and flying 37,000 miles.

DURING November, 2,037 airplane landings and take-offs and 5,682 passengers were registered at San Francisco Bay Airdrome, according to a recent announcement of officials of the airport.

D. C. WARREN has been appointed Northern California and Nevada agent for the American Eaglet.

A HEATING plant has been added to the facilities at the San Francisco Bay Airdrome to heat the offices in the hangar.

THE Avian Club, a model aircraft organization, held its first outdoor meet recently at San Francisco Bay Airdrome. L. Inman is president of the club.

OAKLAND

[H. V. WALDORF]

A TWENTY-FOUR-HOUR airplane and engine service station is scheduled to open at Oakland Municipal Airport February 1, operated by the Pacific Airmotive Corporation, according to Edwin Cooper, branch manager.

THE Sierra Gliding Club has been formed at Truckee in the Sierras. Gliders equipped with skis are used and glider bases have been established on peaks from 5,000 feet to 8,000 feet in altitude. Dog teams are used in launching the gliders and in towing them to the bases. Wilbur Maynard is head of the club.

CAPT. I. E. ELM, head of the Elm Aircraft Company, Oakland, has established a ground school at San Francisco.

NEW records were set at Oakland Municipal Airport during 1930 according to the annual report of the Board of Port Commissioners. Total landings for the twelve months was 84,374, of which 49,006 were by students. The figures for 1929 were 82,316 landings, including 13,009 student landings.

Passengers for 1930 totaled 41,500. The figure for 1929 was 52,900. Student landings for 1928 totaled 4,712.

SAN DIEGO

[L. M. EARL]

THE T. C. Ryan Flying School of San Diego has recently been appointed by the Great Lakes Aircraft Corporation of Cleveland, Ohio, distributors of Great Lakes Sport Trainers for all of Southern California. This territory includes: San Luis Obispo, Kern, San Bernardino, Ventura, Los Angeles, Orange, Riverside, Santa Barbara, San Diego and Imperial Counties.

THE T. C. Ryan Flying School, San Diego, announced as one of their January cross-country flights, a trip to San Francisco. This tour took five Ryan transport students in Great Lakes Sport Trainers from San Diego to Los Angeles, Coalinga, Bakersfield, Fresno, Oakland and San Francisco. The entire trip represents approximately 1,300 miles of flight and was made to give the students experience in mountain and desert flying. Ryan students participate in cross-country trips approximately twice each month.

ARIZONA

[H. G. WILSON]

AIR travel over the Southern Transcontinental route increased 100 per cent during 1930 over the previous year, according to a survey compiled at the Tucson Municipal Airport. During the year, 1,666 visiting planes landed, of which 555 were Government planes and 1,111 were commercial and transient planes. During 1929, there were 408 Government and 427 commercial and transient planes. The figures do not indicate the total travel over this route as many planes land at the former municipal field, now leased to the Mayse Air Service. In 1926, first entire year that the present municipal airport was used, 185 military and 30 transient planes landed at this field.

THE radio station owned and operated by Transcontinental-Western Air Express at Winslow, has been taken over by the Department of Commerce. An airways radio beacon station is being installed.

UTAH

[G. PERRINS]

NUMEROUS improvements, including the construction of an administration building, are being planned for the municipal airport, Salt Lake City, during 1931, according to Gilbert Rich, manager. Approximately $75,000 is expected to be expended for the work, which will include, besides the new building, surfacing, graveling and oiling of a larger portion of the field, installation of

(*Continued on page* 112)

NEW AERONAUTICAL BOOKS

Reviewed by STEPHEN A. McCLELLAN, B.Sc.

The World in the Air

By FRANCIS TREVELYAN MILLER

IN these fascinating volumes the story of man's desire to fly and his achievement of this worthy ambition is recorded in a primarily pictorial manner. There are twelve hundred well chosen illustrations interspersed with just enough text to explain them fully and to maintain the theme of the account without a trace of pedantry.

The earliest myths, art treasures and written records of mankind bear abundant evidence that the desire to fly is at least as old as man's civilization. We are next treated to the many successive known attempts to solve the problem until finally the Montgofier brothers evolve the hot air balloon.

The first balloon flight was followed with a wild flurry of social speculation some of which, like Benjamin Franklin's prediction, were amazingly accurate. While many were theorizing others were applying and we soon see hydrogen replacing hot air and the balloon being used for observation purposes during military manoeuvers, etc. During this period there is a great hue and cry in search of ways and means to make a balloon move at will in any direction. At the same time man is learning the fundamental facts of his new playground, the atmosphere, and acquainting himself with the niceties of handling free balloons, which is the basis of any lighter-than-air transportation.

The parachute is conceived and proven but is accepted by the public, not as a life saving device but as a new thriller. During this same period ballooning passed through an era of ballyhoo, stunt flights and promotion equal to the abuse of aviation as an industry in recent years.

The faith of believers in heavier-than-air flight are substantiated by the success of the Wright brothers and the story of the evolution, application and achievements of airplanes is told in the painless detail that characterizes these volumes. The story is complete up to and including the westward crossing of the Atlantic by Costes and Bellonte.

The *World in the Air* has a universal appeal that makes it of interest to old and young, experienced airmen and novice laymen alike. It is well printed with clear, easy reading type and the illustrations are well executed rotogravures. The binding is excellent and these volumes will make an ornamental as well as useful addition to any library.

Andree's Story

EDITED BY THE SWEDISH SOCIETY FOR ANTHROPOLOGY AND GEOGRAPHY FROM DOCUMENTS ENTRUSTED TO THEM BY THE SWEDISH GOVERNMENT.

THE high esteem in which the world at large holds Andree and his companions is amply proven by the repeated conjectures as to their fate which have found their way into print during the thirty-three years since they vanished from sight on the first attempt to use aircraft to facilitate difficult exploration.

This past summer the world was electrified with news of the discovery of Andree's last camp. Then came word that a kind fate had preserved legibly nearly all of the written records kept by the three scientific adventurers. Even more amazing was the announcement that twelve of their photographic negatives had been found untouched by light and had been sucessfully developed. These pictures record a few of the high lights in their epic struggle to cross the ice and return to civilization.

All of this material has been edited and presented in very pleasing form. The reader is first refreshed in regard to the preparations for the flight, which were ample commentary on the scientific zeal, resourcefulness and daring of the little party. Next is presented the gripping story of the actual flight which ended in a forced landing on the ice floes when a freezing fog weighed down the balloon. This account has been compounded from the contents of the various logs and diaries kept by Andree, Fraenkel and Strindberg. It preserves the accuracy and chronology of the original accounts, each of which was primarily concerned with a separate phase of the adventure, but presents the story in much more readable form.

The same treatment is given to the story of the struggle to escape the clutches of the Arctic after the landing. Their continued scientific interest in all about them, their unfaltering good spirits and ready self reliance in the face of physical torture and tremendous natural obstacles form at once gripping narrative and lofty inspiration.

Gliders and Gliding

By RALPH STANTON BARNABY

MUCH has been written on the subject of gliders and gliding and happily a great deal of this material has been good. It is our opinion that Mr. Barnaby has done much more than produce just another book on this subject for his text is the best we have read to date.

Gliders and Gliding is unique in that it offers an equal appeal to the novice and the old timer. The history of gliding, simple aerodynamics, methods of instruction, launching and selection of proper gliding terrain are adequately covered for the novice. The chapters on soaring, construction and the gliding diagram should have equal appeal to the old timer.

The book is illustrated with excellent diagrams and photographs. The material is well arranged and indexed for reference purposes.

A. B. C. of Gliding and Sail-Flying

By VICTOR W. PAGE

ANOTHER good and timely Henley book prepared with the assistance of the National Glider Association, National Advisory Committee on Aeronautics and foreign authorities. All angles of this fascinating sport are covered from its early history to the details of constructing a modern glider.

The important chapters on the principles of gliding and bird flight are pleasingly terse and informative.

Little America

By RICHARD E. BYRD

THIS is the story of the most extensive polar exploration expedition ever assembled. In the early pages Byrd gives both his definition of the problem the party was to solve and his defense of the elaborate preparations made in order to succeed.

In a blessedly terse style we lope through an account of the expedition proper. We push through to the barrier, establish camp and conduct preliminary explorations of the surrounding territory. We dig in for the long dark winter, emerge with the return of the sun and launch the successful flight south and another to the east before making a mad scramble to get packed up and away while it is still possible.

If there is one lesson that this book points out, it is that exploration under polar conditions can be done better, quicker and cheaper by plane than by any other known means.

"MODERN Diesel Engine Practice," by Orville Adams, consulting Diesel engineer, is scheduled to be published February 1. According to an advance notice, this book was written with the purpose of combining in one volume a text for study and reference, and a practical manual for operation and repair.

TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

American Aircraft Engine Directory

THE second annual directory of American aircraft engines has been issued by The International Nickel Company, Inc. Ratings, characteristics and special features of sixty-five American engines, a virtually complete list, are given.

Nicholas-Beazley Catalog

ANNOUNCED as "the most complete ever distributed by the company," Nicholas-Beazley Airplane Company, Inc., has prepared a general parts and supply catalog designated as "J."

Switlik Safety 'Chute Booklet

A BOOKLET describing the construction, maintenance and operation of Switlik Safety 'Chutes has been prepared by the Switlik Parachute and Equipment Company. The text is illustrated with photographs and drawings.

Columbia "Tech" School Leaflet

THE new aviation department of Columbia "Tech" School, Washingon, D. C., has published a leaflet entitled, "Why Does the Airplane Fly?"

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(Utah News continued)

new hangar lights and a new electric wind vane, erection of a field beacon and construction of a runway to be used by student airplanes.

IDAHO

[G. PERRINS]

IMPROVEMENTS at the Pocatello airport are planned by the city council.

INSTALLATION of a radio beacon at Burley has been practically completed.

To Spend $177,000 on Idaho Airports

[I. M. DURIN]

VARIOUS Idaho agencies plan to spend $177,000 during 1931 for the construction or improvements of airports, it is shown in the first biennial report of the aeronautic division of the Department of Public Works.

The division started its work on March 1, 1929, under an act of the State legislature. It is sustained by gasoline taxes on aviation fuel and by license fees on aircraft and pilots. The requirements for plane and pilot licenses are satisfied by presentation of U. S. Department of Commerce certificates and payment of the requisite fees.

The report shows thirty-eight fields in Idaho, classified as follows: Municipal, fifteen; Department of Commerce intermediate fields, ten; private, five; forest emergency, four; and state auxiliary, four.

Of the funds to be expended in 1931, $70,000 will be expended on new fields and $107,000 on improvements of existing fields.

NORTHWEST

[F. K. HASKELL]

FOUR papers on aeronautics were presented at the meeting of the Oregon section of the Society of Automotive Engineers, Portland, Ore., for the benefit of members of the recently organized aeronautical department of Oregon State College, who were in attendance. The papers were as follows: "The Aircraft Industry in England," by W. R. Jones of Oregon State College; "Welding from a Metallurgist's Viewpoint." by S. H. Graf; "Oregon State College Aeronautical Course," by Dean H. S. Rogers; and "Air Corps Engineering Schools at Wright Field," by J. C. Othus.

Annual Meeting of Portland Chapter of N. A. A.

AT the annual meeting of the Portland, Ore., chapter of the National Aeronautic Association, developments in aviation for the past twenty-five years were discussed by the conference. Julius L. Meier, governor-elect, acted as toastmaster.

George L. Sammis, vice president and general manager of the Sunset Electric company, was elected president of the Portland chapter to succeed Julius L. Meier, who has headed the organization for the past year. Lieut. L. B. Hickman, was named technical vice president; Robert Mount, organization vice president; M. F. Wright, secretary; Capt. Orlo R. V. Hossack, treasurer; and C. O. Lovaas, E. J. Swindells, Archie F. Roth, Lee B. Jamieson, Lieut. B. B. Smith and J. H. White, directors.

Plans for changes in the air code of Oregon, which was used to govern aeronautics as far back as 1921; the appropriation of funds for a state aeronautics inspector and the education of officers to enforce the law were discussed by Basil B. Smith of the Oregon State Board of Aeronautics.

WASHINGTON

[C. M. LITTELJOHN]

SKYLINES, Inc., was recently formed at Tacoma, with a capitalization of $5,000, to operate passenger and freight airlines in this section. The incorporators are B. J. Glein, E. D. Burgess and W. J. Betts.

SPOKANE is making a number of improvements and additions to its municipal airport. The purchase of fifteen lots, two tracts and part of a third east of the municipal airport has been authorized by the city council, with a financial outlay of approximately $9,000.

THE Yakala Flying Service, capitalized at $2,000 has been formed at Vancouver. This service will deal in airplanes. The incorporators are Basil Dhanes, Albanie Dhanes and Keith Goings.

KELSO will take over the Kelso Airport from the Kelso Airport Company. The City Council of Kelso has taken action to provide for the airport's purchase, financing the project in the 1931 budget. A lighting system costing $10,000 was recently installed.

AIRCRAFT

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FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST'S correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

GERMANY

EDWIN P. A. HEINZE

THE Luft Hansa, which is consistently working on the development of long-distance, non-stop flying, has during the past few months given especial attention to the problem of refueling transport airplanes in flight. While the taking of certain risks is, perhaps, justifiable in long-distance and duration record attempts, such danger must be entirely eliminated in regular air transport service when valuable cargo and passengers are carried. Hence, particular care must be devoted to obtaining as high a factor of safety as possible in refueling. The Luft Hansa is coöperating with the German Aeronautical Research Institute to develop the necessary apparatus for this purpose.

Practical tests in which a Fokker F II plane was selected as refueling plane and a Junkers W. 33 as receiving plane, have been conducted. The first, a high-wing monoplane, ensures good vision downwards; the second, a low-wing monoplane, gives the pilot unobstructed vision upwards to the refueling plane, which flies above the receiving plane during the refueling process. The equipment of the refueling plane consists of a hose drum with a hollow shaft through which the fuel is fed to the hose connection on the drum. The hose is made of fabric-covered rubber with an aluminum spiral inside. The length is sixty-five feet and the inside diameter 1.57 inches, the weight being one and one-third pounds per foot. At the loose end the hose is provided with a tap, which closes automatically as soon as it is released from the clamp device on the receiving plane. The end also carries an electric wire with a plug, which must be stuck into a contact in the receiving plane before the hose is connected up. The other end of this wire is affixed to the aluminum spiral inside the hose, and the whole serves to conduct away any frictional electricity that may be set up when the fuel flows through the hose and cause dangerous sparks. The hose is never allowed to run out its whole length. At least one turn has to remain on the drum so as not to overstrain the hose connection when the weight of the hose let down drags on it. In order to prevent the hose from reeling off too quickly and to ensure rapid and easy retraction, it is provided at one end with a worm drum on which a rubber cable is rolled up when the hose is let down. This arrangement is so designed that the tension of the rubber will in all positions of the hose compensate its weight. In addition, a foot brake is provided.

The receiving airplane has a funnel on top of the fuselage to the rear of the pilot's cockpit. The funnel, which incorporates the clamp device referred to, catches hold of the hose tap when the latter is inserted. The mechanic attending to the filling then pulls a lever, causing the tap to open and the fuel to be discharged at the rate of fifty-three gallons per minute into a reservoir from which it is later pumped to the service tanks. The mechanic has, of course, to catch the end of the hose, which is lowered to him as soon as his plane attains the right position in relation to the refueling plane, and after he has given the signal. The nose of the refueling plane during the process is a few yards in advance of that of the receiving plane and care has, of course, to be taken to prevent the hose from touching the propeller. To steady the hose end while lowering it the attachment of a flag has been found very useful, and with the aid of this it has been possible to accomplish refueling even in rough weather. The tail controls of the receiving plane are guarded by bent tube fenders which prevent the hose from hitting them. The floor of the cockpit of the refueling plane is provided with a window of Triplex glass guarded by a wire netting so that the pilot can observe constantly the receiving plane without looking over the side of his cockpit.

Numerous successful flights have thus been carried out, and sooner or later refueling scheduled planes in flight promises to become a regular feature in the German air transport services.

PROFESSOR JUNKERS, pioneer constructor of all-metal planes, has been awarded the Siemens Ring, a very highly esteemed distinction, which is awarded once every three years to an eminent German scientist for valuable work done and for great personal achievements.

THE German Air Board denies the rumor circulated that the next International Light Plane Contest is to be held in 1931 and that the tour will go over the North-European countries, i.e. also over Scandinavia. The next contest, as has previously been decided, will not take place before 1932 and the route of the air tour has so far not been officially discussed.

THE Allgemeine Deutsche Automobil—Club (ADAC), Germany's largest union of automobilists and motorcyclists with a membership of over 100,000, has decided to include aviation among its interests and to foster flying in the ranks of its members. The club will coöperate with the German Air Union.

THE monthly returns of the central airport at Berlin-Tempelhof for November, 1930, show that 193 transport planes took off and 188 landed there on scheduled service, transporting 593 passengers, 103,000 pounds of express and 6,400 pounds of mail. In addition, 106 other transport planes landed and 109 took off and numerous other planes went up for short flights.

THE Rohrbach Aircraft Company has completed the fourth Romar flying boat, which is to be delivered to France. The machine is of the same design as the first three, of which the Luft Hansa took delivery, but some details of minor importance have been improved.

THE German Air Board reports that Robert Kronfeld's sail-flight in his machine "Wien" on August 24, 1930, from the Rhoen has been listed as an international record for Austria, Kronfeld's native country. The distance he covered was 164.51 kilometres (102.2 miles).

ENGLAND

To Re-equip Air Force With High-Speed Aircraft

RE-EQUIPMENT of the Royal Air Force with aircraft having a speed greater by fifty miles per hour than those in use at present has been authorized by the Air Ministry. Contracts for the supply of these aircraft were not announced but the general scheme of re-equipment provides for the building of more than 200 Hawker aircraft. The type to be ordered in the largest number is the Hawker "Hart," a two-place bomber powered with a Rolls-Royce "F" type water-cooled 550-horse-power engine. This ship has a high speed of 180 miles per hour at an altitude of 10,000 feet.

Long-Distance Military Flight

THE sixth formation cruise of the Royal Air Force from Cairo, Egypt, to Cape Town, South Africa, and return was scheduled to start January 12. The flight is staged annually and is included in the regular service routine of the aircraft squadrons stationed in Egypt. Three twin-engined Vickers "Victoria" heavy transport biplanes were to leave Heliopolis Aerodrome with instructions to arrive at Cape Town at the end of the first week in February and to complete the return journey during the second week in March.

This is the first time that multi-engined aircraft have been used in this annual event, the previous flights having been made in single-engined aircraft.

British Military Ship Will Make Tour of South American Countries

PLANS for a demonstration tour in South America of a Wapiti two-place biplane, a British service-type aircraft, have been completed by the Westland Aircraft Works, manufacturers of the ship.

The tour will start at El Palomar Airport, Buenos Aires, Argentina, where the ship will be demonstrated at the British Empire

(*Continued on next page*)

(England News continued)

Trade Exhibition which will be opened March 14 by the Prince of Wales. The ship, which can be converted from a landplane to a seaplane by the substitution of floats for the regulation landing wheels, will be demonstrated both as a landplane and a seaplane in Argentina, Uruguay and Chile.

TO stimulate air passenger travel, Imperial Airways, Ltd., has made arrangements whereby groups of twenty persons or more will be called for at any convenient London address by motor coach and driven to Croydon Aerodrome; taken on a tour of airport buildings; given a flight in one of Imperial Airways' trimotor Armstrong-Whitworth "Argosy" transports; and after the flight, driven back by motor coach to the starting point. The total cost per passenger for this service is approximately $2.75.

LOCATION of 107 landing grounds which will be made available for use by private aircraft according to present plans, has been announced by National Flying Services, Ltd.

SWEDEN

THE first plane to be manufactured by the Svenska Jarnvags Verkstaderna, Linkoping, builders of railroad equipment, will be completed in the spring. The company will not manufacture aircraft engines. Initial production will be limited to planes for the military services. The company plans to produce a sport plane in addition to military aircraft.

CZECHOSLOVAKIA

THREE new airlines will be placed in operation in the early part of 1931, according to an announcement of the Ministry of Public Works. The services are as follows: Bratislava-Piestany; Brno-Moravska Ostrava; and Prague-Carlsbad. It was announced that in addition to the operation of the new airlines, the Marienbad-Leipzig service will be maintained on regular schedule; and that in coöperation with the Swiss Ad Astra Company, planes will be operated regularly on the Prague-Munich-Zurich-Bale route.

ALL of the larger planes operated on the Czechoslovakian state airlines will be equipped with radio apparatus before spring, according to present plans.

SPAIN

AN aerial survey of more than one-half the total area of Spain is scheduled to start some time this year. The survey will be made for the purpose of obtaining maps upon which to base the incidence of land tax on property. Officials of the Spanish government have discussed the project with British aeronautical representatives who have prepared a report for submission to the Spanish authorities. A meeting to decide the final plans for the survey is scheduled to be held in Madrid early this year.

The Spanish government has estimated that the aerial survey could be made in one-fourth the time required by ground methods, allotting ten years for the former method as compared with forty years for the work by ground surveyors.

Spanish Air Force Reorganized

KING ALFONSO has signed a royal decree disbanding and reorganizing the Spanish army air service. Officers and men were given fifteen days in which to apply for membership in the new air corps, or to return to the branches of the army with which they served originally. The decree followed the attempted revolt at Cuatro Vientos Airdrome recently, led by Ramon Franco.

FRANCE

Training of Glider Pilots

A SCHOOL for the training of glider pilots has been established near Toulouse by the French Glider Company (Societe Fraincaise de Vol a Voile). The company does not charge for training but charges approximately $195 each for a series of three lectures which are given under the terms of an agreement with the French Air Ministry. This amount covers insurance. Two lessons per week are given during a training period of from one to one and one-half months. Candidates from all countries are eligible.

The company maintains two flying fields for the use of students. The gliders which it manufactures are sold for approximately $1,950 each.

SAFETY in French commercial aviation is showing a steady increase, according to a recent announcement of the French Air Ministry.

There was one serious accident for every 325,613 miles flown in 1929. This is in comparison with 1928 when there was one serious accident for every 197,096 miles flown.

The length of airlines in operation, distance flown and the number of passengers and the amount of freight and mail carried have shown a steady increase under the Air Ministry which was established in 1928.

The Air Ministry examined 162 types of aircraft during 1929 and purchased seventy-two. In 1930, 116 planes of different types were purchased or ordered at a total cost of 140,000,000 francs (approximately $5,500,000).

CHINA

THE Chinese National government and the German Luft Hansa have jointly organized a corporation which will operate a scheduled air transport service between Germany and China. The corporation is capitalized at $3,000,000 (local currency) or approximately $836,100 (U. S. currency). The Chinese government will hold 2,000 of the 3,000 shares and the Luft Hansa the remaining 1,000 shares.

Tentative plans call for the establishment of a service through Manchuria and Siberia early this year. Four flights weekly are scheduled, two from Shanghai to Berlin and two in the other direction. The planes will carry passengers and mail and will follow the railway route across Siberia.

LANDING fields and radio stations have been constructed at Ichang and Chungking in preparation for the proposed Shanghai-Chungking air transport service of the China National Aviation Corporation.

ONE hundred students are annually selected from a large number of applicants for aviation training at the Military Aviation School at Canton. The successful candidates are given a year's instruction, including English and geography in addition to aviation subjects. Those who successfully pass the flying and ground school courses receive commissions.

CONSTRUCTION of an airport has been completed at White Cloud Mountain near Canton. The field is circular, 3,000 feet in diameter, and provided with cement runways.

JAPAN

Build Dornier-Wal Flying Boat

MANUFACTURE of a Dornier-Wal flying boat has been completed by a Japanese manufacturer at Kobe and delivered to the Japan Air Transport Company for operation on the route between Nagasaki and Shanghai. The plane is an all-metal ship, accommodating eight passengers and a crew of four. The powerplant is a single B.M.W. 800-horsepower engine manufactured in Japan. Another Dornier-Wal flying boat of the same size and type is being built for immediate delivery by the Japanese company.

INDIA

FIVE Heath Parasol planes have been ordered from the Heath Aircraft Corporation, Chicago, Ill., U. S. A., to be delivered to Bezwada, Madras, India. These ships have a cruising radius of 400 miles, a high speed of eighty-five miles per hour and a gasoline consumption of forty miles per gallon.

NEW ZEALAND

A PROGRAM of development has been inaugurated by the flying club at Auckland. The club is improving its landing field at Mangere and has erected a large club house. The field is eighty-two acres in extent and has a landing area with an overall length north and south of 860 yards; and an east-west length of 740 yards.

AUSTRALIA

Makes Record on Australia-New Zealand Flight of Twelve Hours

A NEW record for a flight from Australia to New Zealand across the Tasman Sea was completed by Guy Menzies January 7 in the *Southern Cross, Jr.*, the light airplane in which Wing-Commander Charles Kingsford-Smith recently flew from England to Australia.

Menzies covered the distance of 1,200 miles in twelve hours and fifteen minutes, lowering

the record made by Wing-Commander Kingsford-Smith on the pioneer Sydney-Christ Church flight. He carried fuel sufficient for eighteen hours of flying. No radio equipment was provided.

MEXICO

ADOPTION of the airplane to cover sales territories in Mexico has been announced by the Mexican Trading Corporation, Firestone distributors in Mexico. By means of aircraft the company covers its territory in ten days as compared with six weeks formerly required by rail.

ORDERS for Nicholas-Beazley NB-4 aircraft have been placed with the Nicholas-Beazley Airplane Company, Inc., Marshall, Mo., by several mining companies operating in Mexico. These companies have been utilizing Nicholas-Beazley Barling NB-3 aircraft to transport light express and bullion from mines in the interior of Tamaulipas, Vera Cruz and Hidalgo, and are making replacements with additional orders from the Nicholas-Beazley company.

[M. HURST]

A REDUCTION of twenty per cent in passenger rates on the routes between Tampico, Mexico City, Brownsville, Tuxpam and Tejeria have been announced by Cia. Mexicana de Aviacion. The reduction, which will be in effect until March 31, was made for the purpose of stimulating air travel.

MEXICAN AVIATION COMPANY has announced a reduction of twenty per cent in passenger fares. Airplane fares between Brownsville, Texas, and Monterrey, Mexico, are now 28.50 pesos ($14.25); from Mexico City to Brownsville, 140 pesos; Mexico City to El Paso, Texas, 150 pesos; and from Mexico City to Tampico, 80 pesos.

WORK has been started on a new landing field near Celaya. The field will be used principally by the postal service. Preparations are being made for the inauguration of the airport.

WORK has been started on the erection of a hangar at the aviation field in Pachuca situated at Venta Prieta on the Mexico City Highway.

CIA. DE AVIACION HUASTECAS Y TAMAULIPAS has been formed at Tampico for the purpose of operating a mail and passenger air transport service between Tampico and the principal towns of the states of Huastecas and Hidalgo. Landing fields have been established at Pachuca, El Higo, San Vicente, Tancuayalab, Tempoal, Platon Sanchez, Huejutla and Tantoyuca. Application for concession has been made to the Department of Communications and Public Works and the company will be ready for operations by the time this has been granted. Planes purchased in the United States will be used. In addition to regular trips to and from the points regularly served, the company will make special trips on request. The Tampico terminus will be the Aguila Oil Company's landing field.

Bartolo Rodriguez, Sr., is president of the company; Gen. Anselmo Macias, vice president; Ramon Liano, comisario; and Bartolo Rodriguez, Jr., secretary-treasurer.

CANADA

[J. MONTAGNES]

NEW air mail services in Canada include a new international line between Winnipeg and Minneapolis-St. Paul, and the extension of the Prairie run to Lethbridge, while there is talk of a Calgary-Miami service in forty-two hours, to be extended to Alaska and Asia via the Arctic air mail route at a later date.

The Winnipeg-Twin Cities link will be flown daily in daylight, and will mean a considerable saving in time for western mails. Mails posted early on Monday afternoons will reach Winnipeg the following day, the service connecting at Detroit with the United States lines to Twin Cities and to Winnipeg.

The Lethbridge extension on the Winnipeg-Calgary route has been made with the intention of using Lethbridge as the starting point of the Rocky Mountain service later in the year.

FISH caught in the fresh water lakes of Northern Saskatchewan are now being shipped by air to markets in Eastern Canada and the United States. About 3,000 pounds of whitefish and trout caught on the frozen lakes are shipped by air to Prince Albert, two daily trips being made.

[F. N. DASHWOOD]

EXTENSION of their airlines from Moncton to Halifax where an eastern terminus will be established, has been announced by R. H. Mulock, general manager of Canadian Airways. The line was extended following the placing of all power lines underground at the Halifax airport.

THE Saint John Glider Club, Saint John, N. B., has been organized by Donald S. Young. The club will use gliding terrain situated on a slope near the city. A hangar has been constructed and a training glider has been obtained. Members of the club are given complementary memberships in the Saint John Flying Club.

NIGHT SCHOOL courses in aviation were inaugurated January 12 by the Saint John Vocational School as a regular part of the school's program. Students obtaining the highest ratings in the written examinations given by the Civil Aviation Department at the end of the course will be awarded flying instruction by the Saint John Flying Club.

AFFILIATION of Maritime Airways Company of Halifax with Canadian Airways has been announced. The Maritime company will operate as a subsidiary of the Canadian airline.

FRANK HARLEY, aeronautical engineer of Saint John, N. B., has developed a new type of parachute of his own design. Tests of the 'chute from high altitudes will be made.

PANAMA

SITES for the establishment of emergency landing fields have been selected between Panama City and La Mesa in the province of Veraguas. The fields are located at Chorrera, Bejuco, San Carlos, Anton, Penonome, Aguadulce and Santiago. The sites are natural fields. They have been marked with circles 82 feet in diameter for identification from the air. There are eighteen emergency landing fields between Panama City and David.

CHILE

AN airport will be constructed at Barriles on the route of the National Air Line. Approximately $1,800 has been spent on preliminary marking and preparing of the field. The airport will serve Tocopilla as well as Barriles, these two cities being about ten miles apart.

BRAZIL

THE Provisional government of Rio de Janeiro is contemplating the purchase of the eleven Savoia-Marchetti flying boats which recently completed a flight from Italy. The price the government would pay is approximately $72,000 each, with an offer by the Italian government to take coffee to an equivalent amount in exchange. The planes would be attached to the naval flying corps.



One of the Nicholas-Beazley NB-4 aircraft which will be used by mining companies in Mexico to transport light express



THE GIANT CHICKADEE MODEL

R. O. G. TRACTOR HAVING MARKED STABILITY

By R. E. DOWD

THE great Dutch airplane genius, Anthony H. G. Fokker, has been an inspiration to many youthful experimenters in aeronautics. His genial personality and democratic manner have made it possible for many newcomers in the aviation game to make his acquaintance. He seems particularly to like talking to boys who are studying aviation. Perhaps this is true because he is even now a boy at heart; his enthusiasm is boundless.

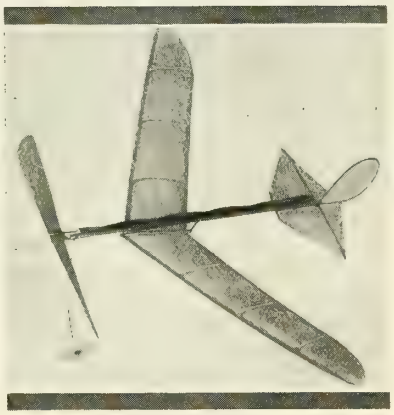
Mr. Fokker in 1909 was a model builder. In 1910 he produced his first airplane which is shown in the photograph. It was called the "Spider" and was an outstanding success. In this machine, Mr. Fokker, then only 21 years old, taught himself to fly. In 1912 with the same plane he won the Russian Military Competition at St. Petersburg, which launched him on his spectacular career as a designer and manufacturer of airplanes.

By this time you will perhaps be wondering what all this history has to do with the "Giant Chickadee." A reference to the photograph of the Spider will clear this up if you are observant and have already studied the drawing of the Chickadee. Note that the wings have a pronounced dihedral. Note also that the principal weights, engine and pilot are high up in the dihedral angle formed by the wings. Subsequent models of the Spider had a sweepback to the wings as well as the dihedral. These features we find also in the Chickadee.

This arrangement of weights and surfaces gives remarkable stability. In fact, the early Fokker planes had no ailerons nor warping wings for lateral control. The stability was inherent.

In discussing this feature with Mr. Fokker a short time ago as we amused ourselves with a paper glider he expressed the opinion that sometime we might return to this design of plane. The prevalence of the low-wing type of airplane would seem to support this contention. At any rate the Giant Chickadee is an excellent flier and its stability is little short of marvelous.

For its design we are indebted to Mr. A. O. Heinrich, pioneer pilot and designer, and Mr. J. B. Billings, a veteran model builder, both of Long Island, N. Y. In commercial form the Giant Chickadee is manufactured by the Broadfield Aeroplane Company of Hempstead, Long Island. The kits sell for one dollar ($1.00) and the finished model for two dollars ($2.00). Any inquiries for materials or models should be addressed to the factory, for the Junior Activities Department does not handle them.



The Giant Chickadee

The Giant Chickadee is one of the simplest models to construct that we have described in this department. It is light enough to be flown indoors and yet, because of its great stability, outdoor flights are possible in a considerable wind. Durations o fmore than seven minutes have been made with this model, the only change being a lighter construction. This was accomplished by trimming the spars, ribs and other members down in size, and also by selecting the balsa wood for extreme lightness. The dimensions given in the drawing, however, represent a model which will be more rugged and satisfactory although slightly heavier.



Mr. Fokker in the "Spider," his first airplane

Let's get out the tools and make the Giant Chickadee. Here is the material list if you wish to make your own kit.

BALSA WOOD

Two pieces 1-16 by 7-32 by 11⅜ Front spars
Two pieces 1-16 by 7-32 by 9....Rear spars
One piece 1-16 by 3 by 4.....Ribs
One piece ⅛ by 5-16 by 15.....Fuselage
One piece 1-16 by ⅜ by 8.....Stabilizer
One piece 1-16 by 1⅛ by 9.....Propeller

ROUND RATTAN OR REED

20 inches, 1-16 diameter..Wing tips and Fin

STEEL MUSIC WIRE

.025 diameter by 11 inches....Landing gear
.020 diameter by 12 inches..
Propeller shaft, rubber motor, hooks and wing clips

MISCELLANEOUS

Thread for stabilizer.
Paper for covering (Japanese tissue)
Dope (Commercial airplane dope thinned with acetone—about one part dope, five acetone)
Celluloid wheels one-inch diameter (two required)
Eyelet or bead for propeller bearing (1 required)
Ambroid cement
Sandpaper
Rubber (⅛ by No. 30 by 4 ft.)
Sheet brass for propeller shaft bearing.
Tee pins for assembly parts.

Assemble the Main Wing First

The main wing in the Chickadee model is made up of two separate wings. The spars are not continuous. The best procedure is to lay out the actual size on a piece of smooth board or cardboard and then build over this drawing. The spars should be tapered and the ribs cut to the patterns. The ribs are simply ambroided to the top surface of the spars and the ends trimmed flush. One wing should be made complete first. Only a light touch of Ambroid should be used at the center rib, and of course the inner ends of the spars should be cut accurately to the correct angle. This finished wing is then propped up with a block three

inches high as shown in the photograph. When the other wing is all complete the final assembly of the two halves may be made, using a liberal coat of Ambroid all around the center rib where the spars butt against it. The wing clips may now be ambroided in place. The short clip attaches to the front end of rib No. 1, and the long clip to the rear.

The secret of constructing rather special forms, such as the Chickadee main plane with its dihedral and sweepback, lies in the generous use of pins to hold each part in its correct place. When everything is all properly lined up, then the Ambroid can be applied. This is the magic touch which makes a true and accurate assembly of all the parts. The process is much the same as that used in making a fuselage or landing gear of a full-size airplane. The welder gets all parts cut to length and clamped in position. He then proceeds to make a unit of the whole with his welding torch. In our work the Ambroid serves as our welding torch.

The Giant Chickadee will fly well with covering only on the upper surface. This arrangement has the advantage of light weight and simplicity. However, the resistance is necessarily high which means greater power is required. It is possible that the lift of this particular single surfaced section will be *greater* than if double surfaced. This may affect the flying speed. We should remember in any case that the model must fly sufficiently fast to sustain itself. Resistance does not control the speed if we apply only sufficient power to fly our model horizontally. By using a double surfaced wing section the efficiency is, of course, greater. Although the speed may be increased by the increased weight, and by the loss of lift, which will necessitate faster flying, still we should be able to fly our model with *less* power. The glide, too, would be considerably improved.

It is therefore proposed to cover only the top surface, trimming the paper flush with the outline. After flight trials are made, the lower surface covering may be added and a series of comparisons drawn. This is the real fascination in model experimenting.

The Fuselage, Tail and Landing Gear

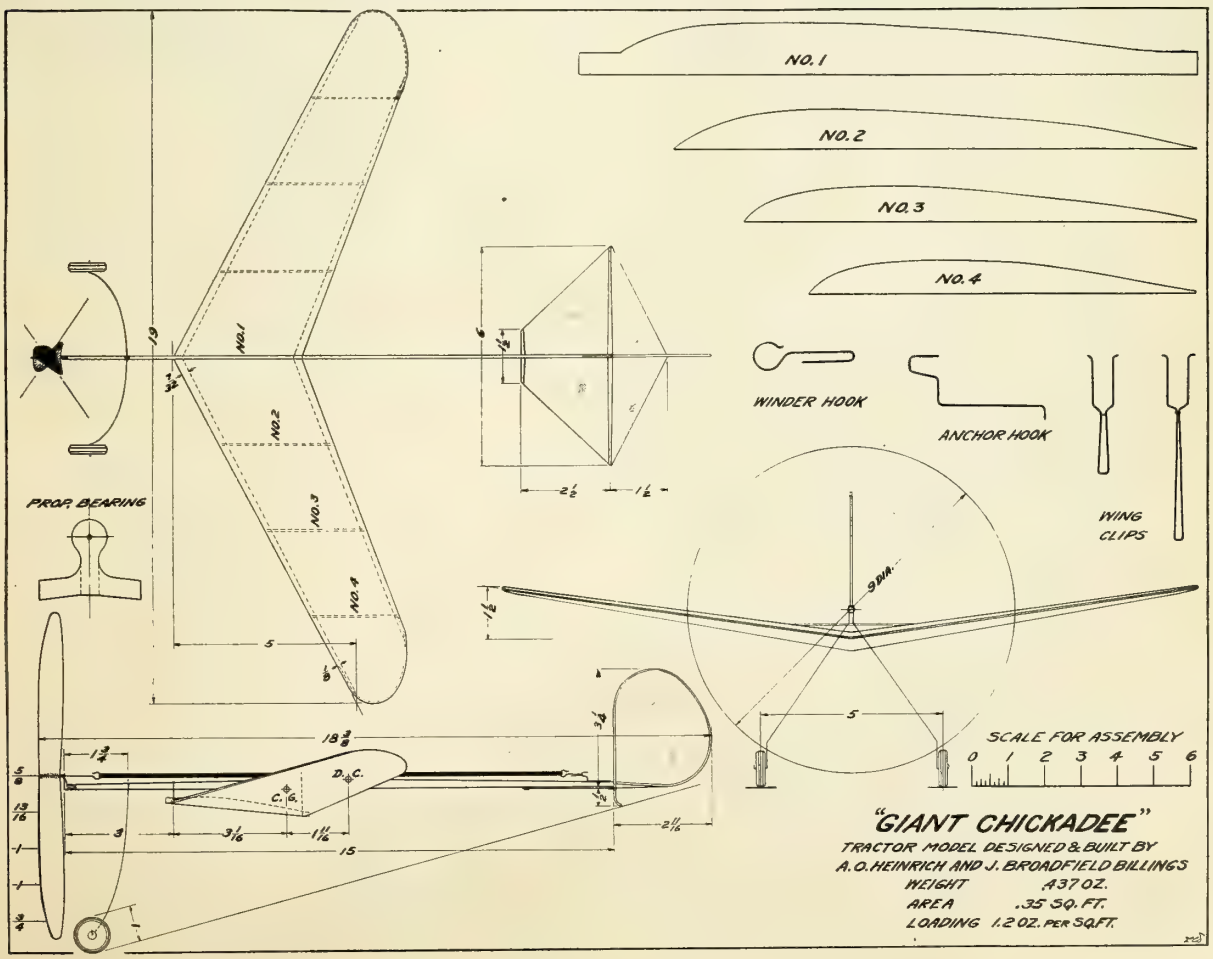
The first thing to do in making the fuselage is to plane the balsa stick down so that it is ⅛ inch thick and tapers from 5-16 inch deep at the center to 5-32 inch at the ends. Only one edge is tapered. The bottom edge is straight.

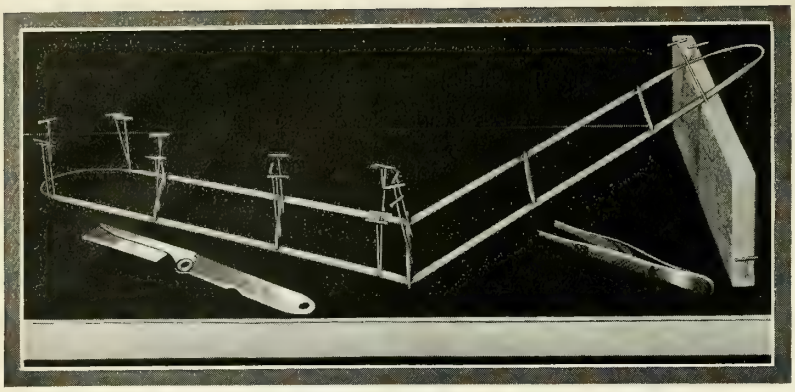
The Fin—The fin should be formed next and ambroided to the very end of the stick. Note that the leading edge of the fin continues down to form a tail skid. The other end of the reed butts against the vertical part at a point level with the top edge of the fuselage stick. Before proceeding with the stabilizer, the fin should be covered with tissue, using a single surface only and one coat of dope. A safety razor blade will trim the excess paper from the edges. No lapping over the reed is employed. It is best to cover the right-hand side of the fin frame, because the shrinking of the paper will distort the frame slightly to counteract propeller torque.

The Stabilizer—The 1-16 inch by ⅛ inch stabilizer sticks are planed or cut to a taper so that the ends are 5-64 inch wide. The thread outline is then wrapped around. The rear point attaches to the bottom edge of the fin. Here too the covering is applied only to one side—in this case. the bottom. The excess paper is trimmed off flush with the outline.

The Landing Gear—A single piece of .025 wire, 11 inches long, will make the landing gear. The drawing shows the correct form. To hold the wheels on the axles, the end of the wire is bent up about ⅛ inch. The fastening to the stick is made with Ambroid.

(*Continued on following page*)





How to assemble the wing holding the parts by the use of pins

Propeller Bearing

About .012 thick sheet brass or tin will make a good propeller shaft bearing. The drawing gives the details. The greatest problem in making propeller bearings is the drilling of the hole for the shaft. If a drill is not available, the hole can be punched first in the form of a depression. By filing the point of the depression flat a tiny hole will appear. Now by using the same pointed punch, which may be only a nail, this time as a reamer, the hole can soon be enlarged to the correct size. Thread is used to wrap the bearing in place on the end of the stick. Ambroid over the thread will make this very secure.

Winder and Anchor Hooks

The scale drawings of the hooks will enable any builder to bend the .020 wire to the correct shape. The anchor hook is ambroided to the fuselage stick after the end of the wire has been forced into the stick. No thread wrap will be necessary.

The Propeller

Limitation of space makes it quite impossible to reproduce a propeller pattern. However, it is simple to lay out. In the first place the trailing edge is not straight. It has a sweepback, so to speak, of ⅛ inch. The various widths at points along the blade are given in the side view of the model.

When the blank has been prepared and the edges sandpapered to reduce resistance, the blades are formed after dipping in hot water. The correct pitch is given in the top view. It represents the pitch at a point three inches out from the hub. After the blank has been thoroughly dried out and resandpapered, the shaft is ambroided in place. Allow plenty of time for this to dry and be sure the shaft is true with the blade.

General Assembly

We are now ready to assemble all the units. Three to four strands of ⅛ inch flat rubber strand will be sufficient. The exact position of the main plane on the fuselage will be somewhere near the point indicated on the drawing. Adjustments are simple inasmuch as the clips may be sprung over the fuselage stick at any point.

It is of interest here to note that D. C. or directional center lies 1 11-16 inches to the rear of the center of gravity. To apply the formula which has been suggested in this department previously, we have Span 19. Length 17⅜, or 19 + 17⅜ = 36⅜ x .046 = 1 11-16. It will be recalled —that most models which have been investigated have revealed a factor ranging from .025 to .050. In this case it seems to be .046. It is also of interest to note how greatly the appearance of the model is improved by using the sweptback wing form. Instead of a long stick forward of the main plane in order to obtain a correct balance, the distance from the front of the fuselage to the leading edge at the center is only about three inches. Note that the center of gravity—and consequently, the center of lift—is almost at the trailing edge of the center section.

Flying

For initial flights, hand winding may be used. Two hundred fifty to 275 turns may be given to the propeller. In launching it is best to release the model so that the prevailing wind blows *under* the wing, which tends to be lowered by the propeller torque. This will be the left wing if the propeller has been pitched as indicated.

Once in the air, the Giant Chickadee flies with easy grace and shows a peculiar responsiveness to side gusts. The dihedral angle and the sweepback, however, quickly stop each tendency to roll. The lateral stability is so pronounced that the action almost seems as though someone were manipulating controls.

After the balance has been worked out and hand-wound flights are satisfactory, it is time to get out the winder. Right here is where your Chickadee is going to give you the surprise of your life, and then you'll know where it gets its name, because Jimmie Smith and Billy Jones are going to say "Boy! Ain't she a bird?"

Just a Check-Up

Where did Mr. Fokker build his first large airplane?

What were the outstanding features of the Spider?

How does sweepback aid lateral stability?

With a given amount of power, does resistance control speed?

If we supply just enough power for horizontal flight. what determines the speed?

Which is more efficient, a single or double surfaced wing section?

THE TULSA AIRPORT POW-WOW

(*Continued from page 92*)

night when delegates will be taken up for a night flight over the city in the airport plane, *Exclamation Point.* This mighty transport was personally constructed by the Tulsa Chamber of Commerce, is an amphibion powered with twenty-four OX motors, and is capable of sixty m.p.h.-t.s.a.d. (top speed after dark). It is an awe inspiring sight to see the fires of the encamped Indians which surround the entire field and which serve as boundary lights for the airport. Although no beacon is visible, the unmistakable aroma of cooking venison assails the nostrils, and it is this scent which has superseded the radio beacon and the visible beacon enabling pilots to fly an unerring course to the Tulsa Municipal Airport.

The second day will see a terrific combat of mental skill on the south apron of the municipal hangar when the Airport Managers Liars Contest takes place. This should be good; imagine the boys against Jack Berry, Al Johnson, Francis Geng, Nat Duffy, L. D. Hammond, R. B. Barnitz, Sangar Green, Shorty Fulton, Bill Centner, Seeley Hall, David Logg and birds like that. The airport equipment men will be the judges of the contest, having proved themselves to be the highest authorities in the land on the subject of the contest.

On the third day all those who are able will be transported to the airport for a detailed study of the lives of the Oklahoma Indian in his native habitat. Those who are too stout to enter teepees will be thrown to the airport equipment men and incidentally will be less likely to get into trouble. As the chill of the early spring evening closes about the airport and the lonely cry of a coyote on the north and south runway reaches the ear, the delegates will be assembled around the big wigwam (temporary administration building) to sing the requiem of the airport equipment men who failed to impress the delegates.

This, gentlemen, is what you may expect at Tulsa in March. Of course other attractions will be provided. In fact, for the benefit of those interested in the oil industry, provisions are being made for delegates to spend the entire three days in the oil fields or to lie unmolested for that space of time in the radium baths of Claremore, home of Will Rogers. It is expected that on the publication of this foreword, thousands of business men (tired) will make plans to invade the State of Oklahoma to take advantage of the luxuries offered to delegates. Therefore it is imperative that all delegates provide themselves with necessary identification. It is sincerely hoped that this forecast meets with the approval of all concerned and that we have been fortunate enough in timing the conference so that an airplane may be seen landing here some time during the three days.

P.A.A. PROCEDURE AND PERSONNEL

(*Continued from page 37*)

The weather report which has been adopted as standard for Pan American Airways is based on the International System and contains the essential weather information required for aviation messages by all weather bureaus. A special form devised for this purpose contains and facilitates transmission of all necessary data. Field managers are thus enabled to keep the approaching or departing pilot constantly informed of weather conditions by which pilots are able to cope intelligently with local storms when encountered.

Provisions for Emergency Landings

No air transport company can hope to find perfect flying weather constantly, and on rare occasions landings have been made at emergency fields located at frequent intervals for this purpose. Before landings of this nature are made, the pilot communicates with all concerned advising the location of the field to be used. After landing, the same radio set is used for making a detailed report to the operations manager who will not clear the pilot for a take-off until special weather reports prove flying conditions favorable. All planes are equipped with emergency rations, drinking water, first aid kits, fire arms and machetes. Should a plane be forced to land and remain on the water or at some isolated emergency field over night, or even for a period of several days, all persons aboard would have sufficient food and drinking water, while the plane itself would provide protection from the elements and the radio could be used for communicating with the operating base during the entire time.

On one occasion when an amphibion mail plane was forced by a local storm to land and remain temporarily on the water near the mouth of the Orinoco River (between Trinidad and Georgetown), radio messages sent from the plane after landing were copied in Mexico City 2,700 miles distant. On another occasion the pilot of a Ford trimotored plane encountered threatening weather in the Republic of Panama and adhering to the "Safety First" policy landed at an emergency field for the night. Ten passengers and the crew slept comfortably in the plane, received food, water and hot coffee from supplies on board and suffered no discomforts. One passenger endeavoring to make steamer connection for Italy at Cristobal on the following morning radioed necessary instructions from the plane, after which all matters required were attended to. The plane took off at daybreak and the delighted passenger made his steamer connection at 10:00 a. m.

Employment of Native Labor

Aerial operations in the tropics present peculiar problems of personnel management entirely different from those in Europe and the United States. The relationship between efficiency and welfare of personnel is decidedly more acute in tropical climates where living conditions, particularly at isolated stations, are not in all respects as satisfactory as employees coming from the United States are accustomed to. Labor laws in practically all Latin-American countries require foreign operating companies to employ from forty to eighty per cent native labor. This requirement necessitates a careful selection of native employees who are sent, at considerable expense, to various training centers operated by the company for instruction to the proficiency required. Company quarters equipped with modern conveniences are maintained at many stations, and where possible, facilities for recreation are included in the plans for the welfare, comfort and health of personnel. Generous vacations with pay are given and employees with their immediate families receive free transportation over the lines of the company.

PERFECTION is the goal of every system of transportation and the millions of dollars expended by railways, steamship lines and motor bus operators in achieving maximum protection is evidence that those operators realize they can in no other way escape the costly consequences of accidents, delays and abuse of equipment. Insurance is a poor and expensive substitute for good equipment and competent personnel. Safeguarding the operation of aircraft must necessarily be developed to a higher degree than is the case with any other public carrier. In establishing effective safeguards and introducing precautionary measures to prevent accidents, PAA has justified the expense of such action in achieving perhaps the highest continued record for scheduled regularity and freedom from accidents thus far attained by any of the larger air transport companies. Passengers who travel frequently over this system, are quick to observe the innumerable details both on the ground and in the air which are carried out with precision and exactness by trained personnel. Whether leaving the magnificent terminal at Miami or arriving at one of the smaller intermediate stations in the West Indies or Central America, the passenger observes that the procedure is uniformly systematized. Gazing from the plane's window, the alert passenger sees many things along these constantly traveled routes that reassure his confidence if at all troubled. Large cleared places with white circles in the center are passed over at frequent intervals. These are emergency landing fields. Some have small radio stations for dissemination of meteorological data; others store spare parts, gasoline and oil in readiness should the Safety First policy necessitate a temporary landing at any of these locations.

As the plane nears an airport one sees the large modern passenger station with its red tile roof. The diminutive figure of the field manager is seen waving his black and white checkered flag as a "clear to land" signal. Landing without a bump, the pilot uses less than half of the available area and taxies immediately to the large concrete landing platform, immediately in front of the passenger station. The wheels of his plane now rest against blocks to prevent motion in any direction, and followed by his passengers, the uniformed pilot and field manager proceed under the covered passageway to the customs office in the passenger station. While the passengers are passing through the customs room where baggage and required documents are quickly inspected, the chief mechanic is inspecting plane, engines and controls carefully while his helpers are refueling. Not a motion is overlooked by the co-pilot who supervises the line service as a check on proper procedure. The field manager and his clerk are busy preparing and checking documents to expedite clearance of the plane for the next station. The uniformed porter places baggage of outbound passengers in the plane. The weight report, which prevents a plane's taking off with even one pound more than the allowable load, must be signed by both the field manager and the pilot. When all is in readiness, engines are started by the chief mechanic who, after the proper warming up period, tests each separately and signs his "OK" on the inspection card. The co-pilot then enters the cockpit and relieves the chief mechanic. A gong

(*Continued on following page*)

(*Continued from preceding page*)

rings once, the senior pilot, flight radio operator and steward leave the field manager's office together and take their positions in the plane. Three minutes later the gong rings twice, and the gate is opened for passengers to enter plane. The door of the plane is secured by the field manager, while the pilot tests all controls, gives each engine a final r.p.m. test and signs the inspection card only when satisfied that all is in perfect order. The field manager with both flags ready, signals at the proper time for propeller guards to remove wheel blocks after which the pilot receives his signal to move forward slowly until clear of the loading platform. The plane is then taxied slowly to the take-off position and leaves only upon a "clear" signal from the field manager who stands in an advantageous position for this purpose. Red and green traffic signal lights are now being installed and will become standard equipment at all airports. They have an advantage over flags, being visible to pilots at a distance of five miles.

P A A Esprit de Corps

WITHOUT an effective means of enforcement, rules and regulations are like counterfeit money. The public is deceived as to their real value. Throughout its entire organization, Pan American Airways has instilled a spirit of enthusiasm, coöperation and fellowship that generates ambition, induces efficiency and promotes trustworthiness. Some call it esprit de corps, others morale, but in the final analysis it is that indescribable devotion to duty without which no man or group of men can succeed.

AIR PIONEERS OF THE WEST

(*Continued from page* 43)

neer, whatever that means. Jim Kinney in 1925 was engineering officer of the Air Service Reserve unit at Crissey Field. Sam Metzger of Air Ferries was assistant, and Marshall Boggs was C. O. Major Edward P. Howard was the air officer at corps headquarters who organized the unit with Hisso Jennies. Practically the whole squadron is now in commercial aviation, Ed Howard as recently resigned chief of Air Regulations, in Washington, and Joe Marriot as present chief of Federal aircraft and pilot inspectors. These boys have made a name for themselves in the East. In connection with Ed Howard, this tall, personable artist-pilot should be included with the early pioneers, for he was a glider builder and pilot back in 1912. In 1911 he was a member of the Pacific Aero Club, of which Guy T. Slaughter was president. Howard is now en route to China as Trade Commissioner for the Department of Commerce. It was Slaughter, an early balloonist, who exported the first appreciable shipment of airplanes to China.

The Period of Deflation

As an example of how aviation in the West became deflated in 1923 and 1924 (and stayed so until the *Spirit of St. Louis* arrived in Paris), one West Coast pilot who had always made good money was reduced to the job of motorman on a street car. He is now flying the mail in the East. California did not suffer the depression which was experienced in the Northwest and the rest of the country. In Southern California the movies used planes and pilots even if sometimes recklessly.

The transcontinental air mail first carried in and out of San Francisco by Stanhope Boggs and "Monty" Mouton marked a definite increase in interest in aviation. In the Northwest the Boeing company was turning out an occasional seaplane and was working for Army and Navy contracts. Douglas of Santa Monica was starting production. In 1923, the Jacuzzi brothers of Berkeley built a high-wing cabin monoplane which is believed to be the forerunner of similar planes of this type. It was tested and flown successfully at Berkeley and in and out of Yosemite Valley.

The Era of Expansion

From the time that the slim Reserve captain and air mail pilot took off from San Diego, en route to Paris via St. Louis and New York, aviation has boomed in the West as it has elsewhere. West Coast factories which were struggling for existence had their outlook brightened. With the transfer of air mail from Government operation to private, air transport naturally increased on the coast. Passenger air transport, which was really pioneered in the West, is believed by many to have advanced further there than in the East. The present transcontinental lines bringing passengers from New York and other points east may be attributed largely to the operating experience gained by the two lines which carried passengers between San Francisco and Los Angeles. It is surprising to many Easterners to learn that the leading cities of the Pacific Coast have for some time been connected by passengers air routes.

And in aeronautical education the Pacific Coast has gone forward. Tex Rankins' school at Portland has been for several years probably the second largest in the country and its system of training has been adopted widely throughout the land. The high school at Galt, California, is the first and as yet only one in the country giving flight training. Wind tunnels at Leland Stanford and other Western universities are teaching embryo designers and carrying on valuable research.

That the three states immediately bordering the Pacific Ocean have made tremendous progress in aviation is perhaps no better illustrated than by their airports. The Oakland, Glendale, Portland airports and others are cited as models throughout the country and even by visiting Europeans who have compared them favorably with their own.

As an expatriated Westerner who reversed Horace Greeley's advice and went East, during the lean years in aviation, I must apologize for not including many names and events which should be mentioned. The start of the world flight, the Dole race, Tommy Tomlinson, Roscoe Turner and his uniform and numerous other people and happenings have been so often discussed that they are not touched upon in this necessarily brief and cursory result of an ill-kept diary.



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THE CENTER OF PRESSURE

(*Contd. from page* 55) and practical form of solution is not depreciated by the small errors involved. The real limitations of the theory, in both cases, are not the simplifying mathematical assumptions, but the simplifying physical assumptions—the absence of non-linear or unelastic deformations in beam theory, and absence of friction in aerodynamic theory. In view of these basic and insurmountable limitations, it seems useless to sacrifice simplicity of results and method to a more complex (though not more useful) mathematical exactness. Accordingly, the higher and apparently refined and improved beam theories have long been discarded in practical work. It will be the same in our field. Aerodynamics is still in its infancy and there are still mathematical investigations dealing with wing sections which overstep the natural limits of mathematical tact. In such work refraining requires more genius than doing, and separation of the essential from the incidental is more important than any unintelligible exactness. The foregoing discussion explains the high points of the only existing simple and universal wing section theory and of the only one that is of practical use, perfectly adapted to the needs and requirements of the praxis. All other mathematical investigations on the same subject are of transient value only, and the engineer does not lose much by missing them.

In the next articles of this series, we shall give some further discussion of the wing section theory, applying it to specific cases for the purpose of accustoming ourselves to its important features. Later, we must combine it with the theory of lateral wing air flow, and then we shall be fully prepared to interpret the experimental results of wing section research and to discuss their use in airplane design.

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TEN MONTHS' AIRCRAFT EXPORTS, 1930

(*Continued from page* 52)

markets show that American aircraft products are each year finding their way into a larger field and in greater quantities. Data for 1925, for example, reveal that one country led all others by a wide margin in its imports of our aircraft and that not more than two countries held a similar position regarding engines and parts. The accompanying tables of aircraft exports in the first 10 months of 1930, however, show that eight countries, representing widely separated markets, purchased planes ranging in total value from $140,000 to $901,272, together aggregating $3,603,531, or more than 93 per cent of the entire value of our airplane exports for the 1930 period. This is true, also, with regard to aircraft engines and parts. A similar wide separation, with concentration in a few countries, is noticeable in the trade areas for aircraft engines and parts; engines exported to five countries aggregate $763,674 or nearly 52 per cent of our entire exports in that class for the 1930 period; aircraft parts shipped to seven countries had a total value of $1,455,499, or nearly 75 per cent of the entire exports in that class for the 1930 period.

China led other Far East countries by a wide margin. Developments shown in this market are particularly noteworthy in that the increasing number of sales being made by American aircraft firms have been consummated where European competition is well established and unusually strong.

In former export statements it was shown that the purchase of American aircraft engines by Japan constituted the greater part of that country's aeronautical imports from the United States, but the accompanying statistics indicate an expansion of trade in our airplanes and parts as well as in engines.

The results of the pioneering sales efforts by American aircraft exporters are becoming more apparent in the Far East trade area. For example, an initial shipment of American planes was exported to Java. Though actual sales to other parts of the Far East territory have been relatively small, the increased number of inquiries received during this year definitely indicate that American aeronautical supplies are being considered by prospective buyers whose purchases were formerly made in Europe.

Since American exports of aircraft equipment have reached a volume basis, Canada has usually led all other countries in the purchase of our airplanes; but during the 1930 period it was surpassed by China and Peru in value of sales but not in number of planes taken. This is explained by the fact that all airplanes going to Canada were commercial, whereas the majority going to China and Peru were the more costly military types.

Germany continues to buy the largest quantity of engines from the United States, with Peru, Soviet Russia in Europe and the Netherlands following closely. The exports of aircraft parts serve roughly to indicate what trade areas are using miscellaneous American aircraft products, not including replacement parts. Recent developments in Scandinavian countries point to added business within the coming year for American aeronautical factories. The Union of South Africa took two American airplanes during the 1930 period, for use on airlines there. Previous sales in this territory consisted of aircraft engines and accessories, the two planes referred to being the first exports of American aircraft entering South Africa.

This expansion may be attributed to a number of factors, such as the establishment of more efficient foreign dealerships and more energetic and improved exporting branches of American factories. Probably the most favorable item in this respect is the fact that American airplanes are not only keeping pace with foreign-made equipment, but are more and more meeting successfully the competition of active foreign aeronautical firms. If our exports can be maintained at this satisfactory level, under the unfavorable economic conditions that now prevail throughout the world, it is not unreasonable to believe that important strides can be expected when business conditions return to a normal level.

AIR—HOT AND OTHERWISE

(*Continued from page* 50)

authority had decreed that the N.A.C.A. should conduct scientific research.

Such is the defense the management of the N.A.C.A. summons, a defense worse than none. It begins with mild mocking on the degree of courage necessary for attacking scientists—as if any scientists were attacked. The absence of scientists on the staff of the N.A.C.A. was attacked, and the politicians who occupy positions rightfully belonging to scientists were attacked. Certainly it takes more courage to defend their presence there than to criticize the absence of scientists. It takes more courage to disclaim the policy laid down by authority of office and public consent than to plead for it. It takes more courage to advocate a use of public funds other than that for which they were appropriated. It takes more courage to sacrifice the interest of the industry and to advocate administrative measures foreign to American spirit than to ask for a clean

(*Continued on following page*)

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(*Continued from preceding page*)

policy. Pleading weakness and inability to defend oneself in a case like this, where the defense would be easy if the criticism were unjust, is inadvertently an admission of guilt. Where are the advances of science made by the N.A.C.A. at Langley Field? Why not enumerate them, if there are any, instead of lapsing into disputes about personal courage?

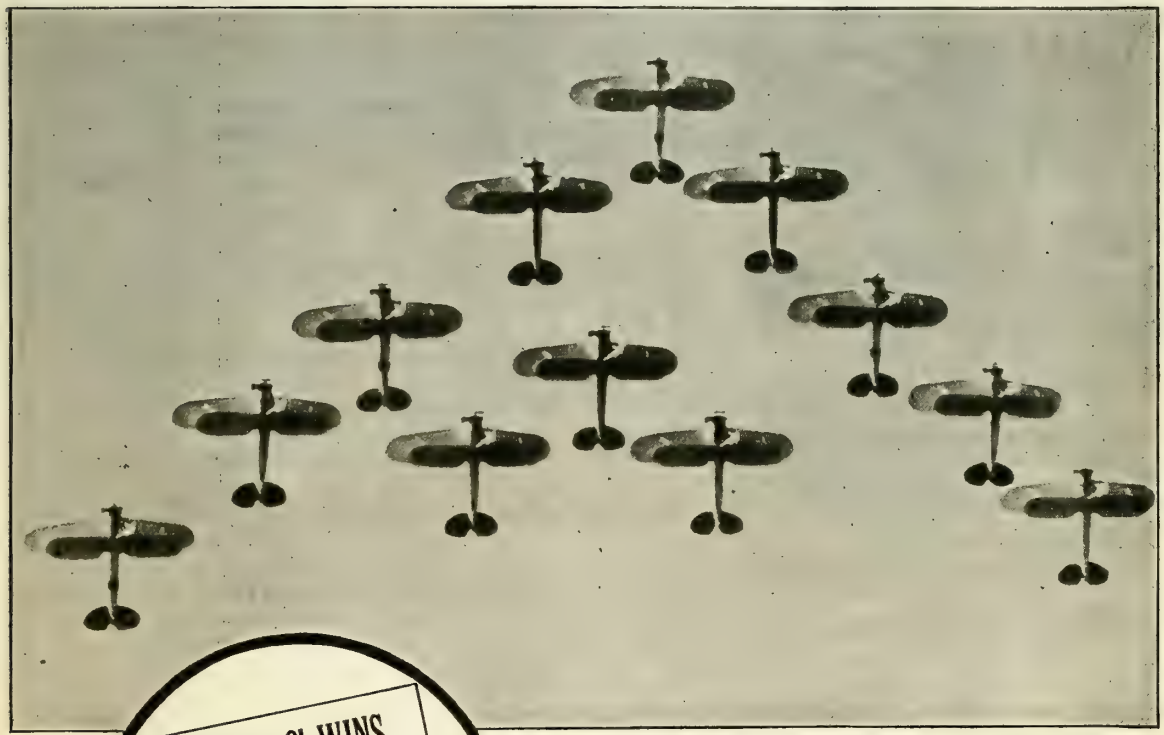
Let us review, in short, what results the champion of the N.A.C.A. is able to point out. As the most conspicuous achievement, he mentions the Townend Ring and the fuselage cowling, admitting that the N.A.C.A. did not invent the latter. With the evolution of the cowling, the N.A.C.A. had nothing whatsoever to do. It is nevertheless seriously suggested that neither cowling nor ring would have been adopted by the industry had it not been for the N.A.C.A. The industry is alleged to be so timid that the information about improvements available is not sufficient to induce it to adopt them; the industry needs the guiding hand of the N.A.C.A.; the industry does not trust and has no confidence in its own speed tests made by its own pilots. The implication is that, instead, it waits until the N.A.C.A. measures in pounds and ounces the diminishment of the drag in consequence of some improvement and then computes the increase in the speed. The industry, it is seriously alleged, has more confidence in such computed speed gain than in a speed gain directly observed. How grotesque! We really have cause to admire the courage of one who advances such opinions. He dignifies this business of measuring by calling it "determination of relative merit," which must have something to do with the theory of relativity. At least we must confess that we fail to understand it fully.

As further useful research of the N.A.C.A., our attention is called to the pressure measurements of floats. There is certainly some use in such measuring. A tailor taking down the measurements of his customer also does something useful. Measuring pressures is but a secondary duty of the N.A.C.A.; its chief duty is to measure pressures (if any) in such a connection that scientific theory is advanced thereby. This was not done in the case mentioned.

As a third citation of successful activity of the N.A.C.A., another pressure measurement is mentioned, one which likewise failed to advance science—the pressure measurement over the dirigible *Los Angeles*. Although genuine contribution to science is in fact not claimed for this work, it is contended that these measurements have proved indispensible for practical purposes, and that the new Goodyear Navy airships will be stronger and lighter in consequence of them. We doubt whether the design staff of the Goodyear-Zeppelin Company will agree. The strength and weight of a dirigible depend upon structural improvements and aerodynamic progress. The air force loadings assumed for the structure of a dirigible are based chiefly on theoretical aerodynamic developments (to which no research at Langley Field has ever contributed), together with one numerical factor, based on operation experience. It is a curious fact that the Goodyear-Zeppelin Company after its experience with more than 120 airships arrived at a different factor than the U. S. Navy with its experience with two airships. A commendable research project would have been an attempt to clear up that discrepancy. Instead, the N.A.C.A. made some pressure measurements, leaving the whole question as it was before. No harm done; dirigibles will continue to be improved without the assistance of the N.A.C.A. But, after all, why all the measurements?

(*Continued on following page*)

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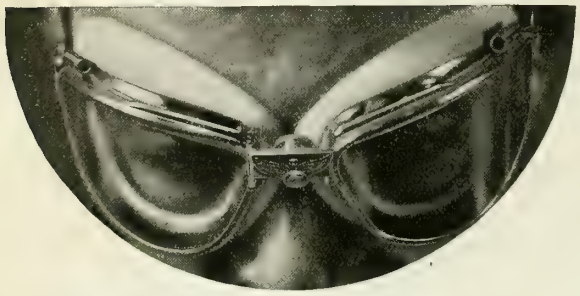
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SOUTHBRIDGE, MASSACHUSETTS

(*Continued from preceding page*)

It is obvious, therefore, that our arguments have been strengthened by those of the advocate of the N.A.C.A. We stand in line with the supervising body of the N.A.C.A. and insist with it that scientific research is the proper and chief domain of N.A.C.A. activity. We advocate that capable scientists be encouraged to join, not to leave, the N.A.C.A. staff. We heartily agree with the able and patriotic chairman of the N.A.C.A. that the N.A.C.A., to borrow his own words, "undertake investigations directed by men who know the problems and the means of their solution" and that such changes be effected as are necessary to bring this about. We insist that it is not the function of the N.A.C.A. to gape and squint at what others are doing, like a loafer standing on the street, and do at best a little measuring to see whether the work was done right, but that it should be the purpose of the N.A.C.A. to do things itself. Aeronautics has not yet reached its goal. The final shape of airplanes will eventually be quite different from what we have now. We want that development hastened. We want a critical and scientific survey, an exploration of all known possibilities. It may be possible (it probably is possible) to increase the specific lift to ten times what we have now, and we want a central institution of research to give us light on that. It may be possible to reduce the specific drag to one-tenth what we have now; the theory of air motion producing drag is still entirely in the dark. Friction of air, as such, does not account for more than one-twentieth of actual drag. We want to have some light on that too. We want knowledge concerning boundary control, concerning the effect of rotating cylinders, of vibrating surfaces, of lubrication, of autogiros, of Flettner cylinder, of jet action, of shooting action, of sound wave action, and of chemical action. Indeed the possibilities are without limit. We want a national agency to explore these unexplored regions, and to do so with scientific spirit, systematic thought and honest endeavor. We are not satisfied with useless pressure measurements and with the building of wind tunnels which will never be really usefully employed. Build small laboratories and do big things in them; not the other way. Only then will the nation attain high rank in world aviation.

Our conviction as to the failure of the N.A.C.A. is not an original idea. The conditions existing have been recognized by none other than General John J. Pershing, who states in the third chapter of the story of his war experiences, appearing in the New York *Times,* Wednesday, January 14: ". . . we had some fifty-five training planes in various conditions of usefulness—all entirely without war equipment. Of these planes it is amusing now to recall that the National Advisory Committee for Aeronautics, which had been conducting *an alleged scientific study of the problem of flight. . . .*" General Pershing was in a position to know and no one can question his sincerity.

WELCOME THE MOSQUITO FLEET

(*Continued from page 57*)

rangements must be very comfortable.

In the matter of door provision, too, several common sense rules appear to be ignored by many manufacturers. First of all, doors should be of adequate size and placed in front of—not abreast of—the seats they serve. If the engine is of the usual right-hand type, then the right-hand side of the ship is the lee side, and if only one door is used, it should be placed there. Again, in light planes where the prop can safely be swung from behind, on the right side, this location of the door makes for added convenience. If

(*Continued on following page*)

LEARN AVIATION at LINCOLN...WHERE "LINDY" LEARNED



In his book, "WE", Lindbergh tells about his early training days at Lincoln. Here is an extract:

"On April 9, 1922, I had my first flight as a passenger in a Lincoln Standard with Otto Timm piloting. The next two months were spent in obtaining my flying instruction and in learning what I could around the factory, as there was no ground school in connection with the flying course at that time."

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THE LINCOLN MECHANICS' SCHOOL is one of the finest equipped in America. More than $250,000 worth of buildings and equipment . . . competent, government-licensed mechanics for instructors . . . 20 years' experience. Ground and Flying School government-approved, but far exceed requirements. *Tuition is very reasonable.*

EQUIPS YOU FOR GOOD JOB . . . The Lincoln Mechanics' Course equips you as a Master Airplane Mechanic . . . ready for a position at an airport or factory . . . or to travel with a pilot.

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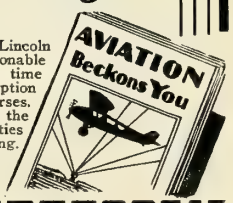
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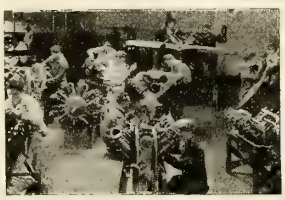
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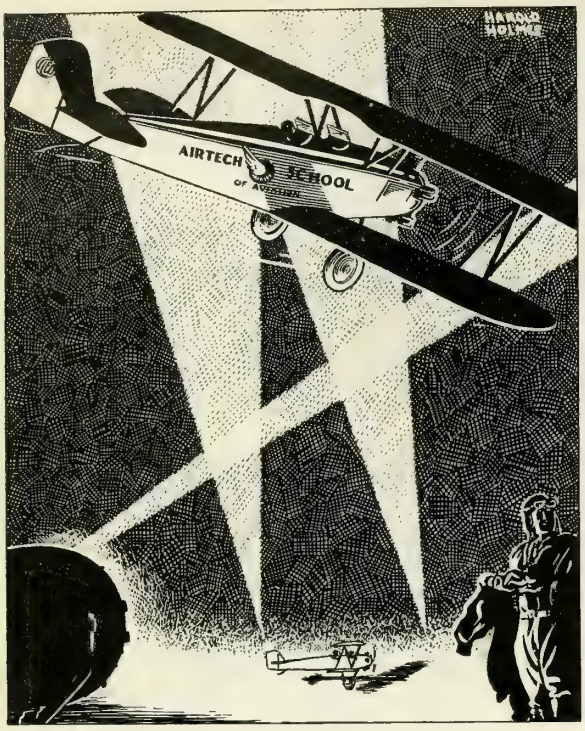
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AIRTECH

Lindbergh Field, San Diego, California

(*Continued from preceding page*)

an external lift truss is used, the anchorage may well be placed to the rear of the door for further accessibility.

Aircraft designers seem to have paid scant attention to doors in the past, and in lazily adapting the conventional side-hinged swinging door to the airplane, may have overlooked a better bet. The drawbacks to this type are many: the hinges must be along the front side of the door from the standpoint of safety in flight, which fact frequently governs the placing of structural members and limits the size of the door; opening the door in flight is not the best of etiquette from the pilot's viewpoint, and this operation is inconvenient in abandoning ship, if and when necessary; and on the ground the door must fastened when opened or it will persist in an annoying flutter while the engine is idling.

The sliding door, though it possesses none of the before mentioned disadvantages, has a few all its own in that heavy double walls are required from the safety viewpoint and the side of the plane must be straight for a distance equal at least to twice the width of the door.

An arrangement which may surmount these difficulties lies in the adoption of the parallelogram hinge. The parallel opening type makes it possible so to design the door or hatch that it can be opened either forward or backward, upward or downward, to favor structural considerations.

Steps too must be provided—not in the form of an occasional four-inch length of tubing protruding wherever the structure happens to permit, but in the manner of generously proportioned stirrups, properly located, enabling passengers to enter and leave with a minimum amount of trick balancing.

Another field of effort open to imaginative designers lies in the creation of suitable all-weather cockpit enclosures. In order to afford the utmost in comfort for its users, the airplane should be readily convertible to suit weather conditions, in flight as well as on the ground. To accomplish this end with the minimum of weight and resistance while providing the maximum in visibility, simplicity and durability, is not the simple problem it at first appears to be. Yet, a satisfactory solution must, and no doubt will, be found before long.

Probably no other unit of a light plane deserves as much attention as its control system. The fact that the air loads are small seems to presage the general adoption of cam action controls in order that super-sensitiveness may be overcome and over-controling made difficult. The light plane need not be dual-controlled—many a single-control make, with a convenient seat for the second passenger, will undoubtedly enjoy a large sale. It is well to bear in mind that regardless of the system used, whether stick or wheel, the dual-controlled airplane is of distinct advantage to the industry in spreading knowledge along this line. In the case of side seating at least, a shiftable control may well be adopted generally.

The private owner generally will be his own mechanic, and in order that too much of his allotted time for pleasure may not be spent in rigging and inspecting his plane prior to a hop, a rigidly braced structure entirely without wires appears to be a probable requirement. The number of important hinge pins and movable parts should also be reduced to an absolute minimum, for plane inspection should be more generally encouraged by the industry, and the best means of accomplishing this end is in reducing the number of parts requiring inspection.

In brief the light plane must be primarily a one-man machine. It should be possible for the owner to fold the

(*Continued on following page*)

THE FASTEST SELLING LINE OF AIRPLANES

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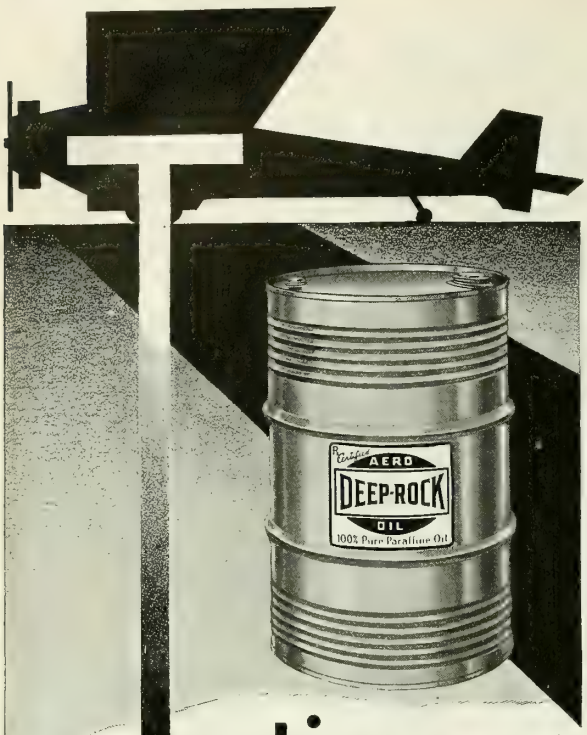
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"Whirlwind J-6 shows little or no wear and tear on any parts after 553 hours of sustained flight; Deep-Rock Gasoline, Aero Oil and rocker arm lubricant were exclusively used," wrote G. W. Vaughan, president of Wright Aeronautical Corporation.

"Ran 20 hours without change and found Deep-Rock oil perfect; cut oil consumption 30% in my Whirlwind J-5; Deep-Rock Aero Oil Grade No. 4 functions perfectly at 10 below zero and 100 above," testified J. D. Brock.

"Edgewater Flying Club equipment operates with less than 50% as much oil; condition of engine parts ample evidence of correct lubrication with Deep-Rock," stated J. C. Byran, Club Manager.

"Wasp engine has 895 hours to its credit with only one overhaul (at 473 hours) and it is no exaggeration to say that engine sounds and performs like new," was part of Dick Allen's statement.

"Our successful endurance flight certainly proved the value of Deep-Rock Aero Oil," said John & Kenneth Hunter.

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Further data regarding these and other actual experiences with Deep-Rock lubrication in air-cooled and water-cooled engines of all types is available. Write us for complete information.

Deep-Rock Aero Oil is made in four grades, every drop Certified and every drum Sealed. New refining processes produce these oils from pure paraffine base crude. Absolute uniformity is guaranteed.

Aircraft Division

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(Continued from preceding page)

wings in a few minutes time, to handle it easily for placing or in towing it to his own car-plane garage. One-man starting arrangements must be safe and convenient without the use of an expensive and heavy self-starter. This may easily be accomplished if provision is made for holding on to some part of the plane with one's left hand while cranking with the right. It is assumed that both switch and throttle will be located conveniently to the left hand also, thus obviating the use of wheel chocks and preventing runaway plane episodes.

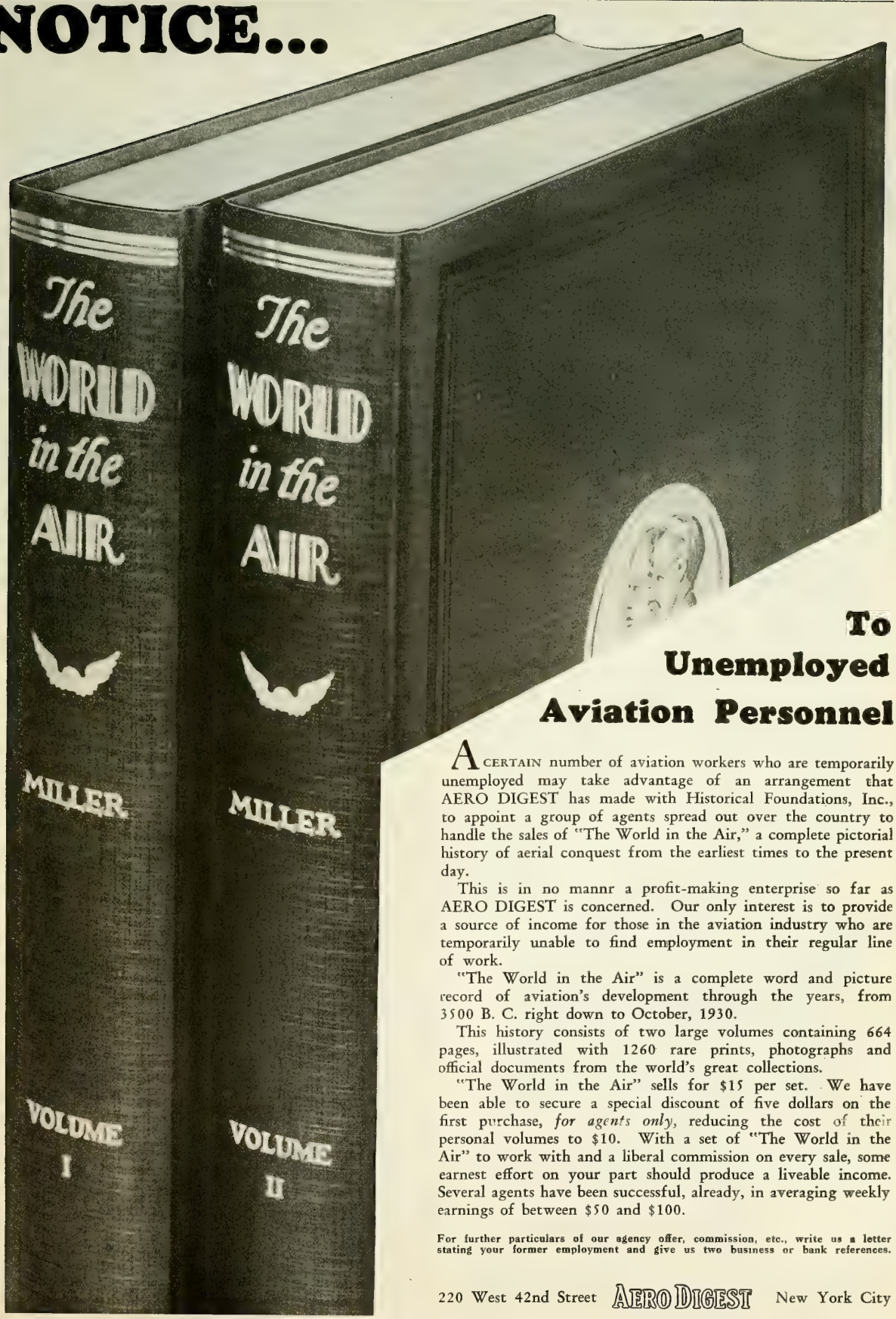
One matter that will require later revision if neglected in preliminary light plane designs is the allowance for adequate disposable loads. Not only should the Department of Commerce allowance of 170 pounds per passenger be adhered to, even though above the average weight, but 10 to 20 pounds per passenger should be added for baggage allowance and a compartment provided large enough to hold at least one suitcase. Fuel for at least four hours cruising and oil for six hours should also be carried. Similarly, the net weight should include allowances for battery and lights, metal prop, engine tools, engine and prop covers, etc., that may be desired by the purchaser as additional or optional equipment. The power reserve of light planes cannot be great, yet every effort should be made to have it sufficiently large so that when the engine revs begin to fall off the plane will not become useless or dangerous.

The minimum desirable cruising speed for a light plane probably is in the neighborhood of 60 miles per hour, which, taking the average wind into consideration and the fact that only 25 per cent of the winds favor the itinerant flier, will allow a dependable cruising speed of around 50 miles per hour. To those inclined to criticize this figure it may be pointed out that the average automobile speed probably is not over 30 over circuitous routes or an effective direct route speed of, say, 25—which indicates that the plane will be twice as efficient for occasional business trips. Generally speaking, however, light plane pilots aren't going anywhere. Power reserve sufficient to guarantee a maximum speed in excess of 120 per cent of the cruising speed is assumed.

In the matter of landing speed it should be borne in mind that, although a general decrease here is desirable, yet if reducing the landing speed is carried to extremes the usefulness and safety of the plane may actually be curtailed. The landing speed of a plane probably approximates the wind velocity in which that plane may safely be flown by amateur pilots. There is, of course, the possibility of a two-point landing into the wind and a wide swing away from it; yet, as with slipping and fish tailing, maneuvers of this sort may best be left to more experienced pilots. The fewer tricks that a private plane requires of a pilot, the better the plane. A ship that has a landing speed of 35 miles per hour certainly should not be used in a wind exceeding that velocity. Incidentally, Van Zant's figures of some years ago covering the air mail run, Chicago to New York, indicated a 35-mile wind five per cent of the time, the average wind being seven miles westerly.

In placing particular emphasis upon the attributes of economy, comfort and convenience in preference to those of performance, I merely express my belief that the popular light plane will be a pleasure vehicle first and a flying machine afterwards—a ship that an average man can acquire and master with the minimum of expense and effort. No amount of performance can make a winged rumble seat bearing a high price tag, appeal to the average flier.

NOTICE...



To Unemployed Aviation Personnel

A CERTAIN number of aviation workers who are temporarily unemployed may take advantage of an arrangement that AERO DIGEST has made with Historical Foundations, Inc., to appoint a group of agents spread out over the country to handle the sales of "The World in the Air," a complete pictorial history of aerial conquest from the earliest times to the present day.

This is in no mannr a profit-making enterprise so far as AERO DIGEST is concerned. Our only interest is to provide a source of income for those in the aviation industry who are temporarily unable to find employment in their regular line of work.

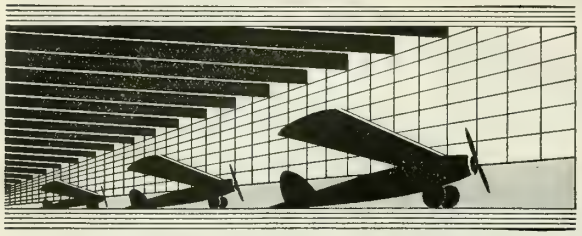
"The World in the Air" is a complete word and picture record of aviation's development through the years, from 3500 B. C. right down to October, 1930.

This history consists of two large volumes containing 664 pages, illustrated with 1260 rare prints, photographs and official documents from the world's great collections.

"The World in the Air" sells for $15 per set. We have been able to secure a special discount of five dollars on the first purchase, *for agents only*, reducing the cost of their personal volumes to $10. With a set of "The World in the Air" to work with and a liberal commission on every sale, some earnest effort on your part should produce a liveable income. Several agents have been successful, already, in averaging weekly earnings of between $50 and $100.

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of 1931

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Every inch of the 200,000 square feet of exhibition space available for the National Aircraft Show of 1931 has been sold! Never before in the history of any aircraft show has space been taken so rapidly — and so far ahead of the opening!

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For information write to

RAY COOPER, Manager
Aircraft Bureau,
Detroit Board of Commerce,
Detroit, Michigan

MAKE YOURSELF USEFUL

(*Continued from page* 46)

which they will never get at desk or work bench. They are thinking of the life, not of the trade.

A boy who is sound in wind and limb doesn't want to be something; he wants to do something. And his young ideas and aspirations are likely to point to where the doing is being done. Just now he thinks that aviation is the place, and considering what has happened in the seven skies since he was born you can't blame him.

A growing boy goes in and out of a dozen ambitions, while his elders stand by in astonishment and apprehension. Very likely they suppose that these young ideas are ominous signs for the future. Very likely they are nothing of the sort. They are growing pains. They are symptoms of a boy's discovery of himself, translated into the language of the world he sees and knows. They reveal his moods, not his destiny. And they shouldn't be taken too seriously, not even by Mid-Western professors with nothing better to do. And for parents to take them too seriously may turn out badly for the boy, for a boy's ambitions look sometimes one way and sometimes another. They are restless as the wind, but their direction doesn't mean much at any particular moment. And to tie a boy's future too soon to a trade or profession because he thinks he knows his own mind is about as sensible as to apprentice a small boy to the circus because he likes to stand on his head.

But what about all these would-be pilots, their fingers itching for stick and throttle and their heads full of notions of the pilot's fascination for the fair and frail females?

Well, there was a young gentleman in to see me lately, asking advice as to how he could carve a career out of the aeronautical industry. It's beyond belief that anybody should ask my advice, but it so rarely happens that anybody takes it that no great harm is done by the asking. Had I been as honest as I should be, I would have told him to run along and ask a policeman, but he was a nice boy and there's nothing like conversation to keep a man from work which he doesn't want to do. So we talked the matter over.

As we did so, I discovered that his case is typical and a little touched with tragedy. For at a rather tender age he is become a specialist and does not know what to do with his specialty. He has fifty-three hours of flying time to his credit and a limited commercial license to prove it. He is bothered by the fact that a benevolent Department of Commerce expects him to fly ten hours every six months or have his license die on him. He doesn't want it to die and he wants to go to work.

It didn't help much to tell him that aviation is standing around just now wondering what will happen next and that there are plenty of pilots of sorts and never enough good ones. His trouble is not that he is a bright boy looking for a job in a nice clean business. He has become a specialist too soon. Through some accident of ambition he has got ahead of himself and is in deep water with only one straw to hang on to. It looked like a good straw when he picked it out, but now it doesn't seem to be taking him anywhere.

I think I mentioned before that it doesn't seem wise to tie a boy to a trade too soon. It can be a tragic mistake when times are bad, for then the unseasoned specialist is the least fortunate among men. His case can be tougher than the case of those who sell apples on street corners, for he is the hardest among all the unemployed to fit to a job when jobs are scarce.

(*Continued on following page*)

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A UTILITY glider of advanced design, beautiful appearance, and thrilling performance, built entirely around the famous Rhon Ranger Primary Trainer. In this graceful ship lovers of gliding can experience the full joy of mastery of the air.

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A book for youth and parent to read together, and for both to understand. Explains the physics of flight so it is readily understood, and so that the youth will be a step ahead when he studies physics in High School or College.

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While flying, air is forced through the venturi tube (on top of each cup) which partially exhausts the cup interior and so eliminates lens fogging.

Each lens affords a lateral range of vision of 135° and their surfaces are ground with a precision that permits of no image distortion. This frees the flier from those headaches which usually come from eye-strain during prolonged periods of goggle wearing.

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"If we're real frank with ourselves, I think we'll both admit that we're damglad to see a new year under way, with brighter prospects and fresh hopes.

"The question is, what are we going to do about it?

"So far as we're concerned, we're sticking by our guns here at Troy. We pulled through 1930 with what is, under the conditions, a very satisfactory showing. That is because we refused to be stampeded into excess production during 1929, had no surplus production to carry over either at the plant or in the hands of distributors, and could proceed with the new Model F and the other 1930 WACO developments without any millstone of 1929 airplanes to load us down.

"We never have—and we won't—high-pressure our distributors into excessive commitments.

"We never have—and we won't—undersell our own dealers to dispose of surplus stock labeled as 'demonstrators.'

"We have found that our own profits are conserved by putting the interests of our distributors *first* in fixing our policies. It pays us—just as it pays them. And for the same reasons.

"That's why 1930 has been a quite satisfactory and profitable year for most of the WACO family—and why 1931 will be even more so. Some territory is still 'open'. But it won't be long now!

"What do *you* say? Can we help each other to greater profits in 1931?"

W. R. Perry

Sales Manager

THE WACO AIRCRAFT COMPANY, Troy, Ohio.

WACO AIRPLANES

"ASK ANY PILOT"

0-29

(*Continued from preceding page*)

For contrast let me mention the man who has lately reformed and refreshed my suburban estate, which is one of those fine old country places which always look as though a herd of elephants had just walked over them, followed by the sheriff and a volunteer fire company. I gave the gentleman a job because he needed it and because I grow lazier with every new gray hair. Without half trying I found a number of things which needed attention.

He attended to them. He mended furniture and windows, inserted washers in the plumbing and cleaned up the yard, papered a ceiling and took out the ashes. He framed three pictures, repaired the toaster and fixed the fireplace. He adjusted doors so that they would open and windows so that they would shut; he upholstered a chair, scrubbed a floor and put a heel on a lady's shoe. He was easily the most useful man who ever did a day's work around my house and grounds, not excepting myself. But if the best little well-digger or certified public accountant or trapeze artist or airpane pilot in the world had come to my front door and asked for a job, even at reduced rates, I couldn't have done a thing for him.

The point is that when business is bad or uncertain, the useful man is the only one who is safe. The specialist is safe while he sits tight in a job which everybody else would like to get, but if he gets shaken loose from it he is likely to be in a bad way. And the young specialist who has never had a job has a hard time finding one when there is not enough work to go round.

So what is a bright boy to do, if he knows too much for his own good? There must be many who are asking themselves this question, some of them with flying time to their credit and nothing to show for it but a certificate or a defunct license. Some of them are sore because they have found out that flying school is a long, long way from the pilot's seat on a transcontinental transport. Some are quite ready to blame the aviation industry for their own blunder and might ask for their money back if they could find anybody in the industry who has it. Some are still hopeful, but don't know what to do next.

My own feeble answer to my young visitor was that there was nothing much for him to do but to hang around and make himself useful. His flying time is only so much experience—as expensive as experience is likely to be—and there is not enough of it to earn him a job and too much to be charged to the profit-and-loss account. Some day it may be very useful to him, since very little experience goes altogether to waste and some of it is likely to turn up a big profit at the most unexpected moment. But if he wants to be a commercial pilot—which is an ambition that most commercial pilots can't understand—he had better quit looking for a job as a commercial pilot. He had better get acquainted with the aviation industry or business in any department he can, and make himself useful. And if he does so, he may find out that it was something else that he was shooting at when he signed up for flying school. He may become a salesman, an executive, a mechanic, a radio operator, a designer or nearly anything else appropriate to aviation. And whatever happens to him, his flying time and skill will always make him a better man for the job than the other man who is after it.

Most men who amount to much have been kicked upstairs by circumstances which seemed to deny their ambitions and best intentions. I know a number of men in high places in aviation who certainly didn't know where they were going when they started. I know several smart pilots who started as office boys, grease monkeys or hot

(*Continued on following page*)

THE MARSHALL FLYING SCHOOL

(INCORPORATED AND ESTABLISHED 1923)

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SPECIAL 10-HOUR FLYING COURSE — Including 7 weeks' mechanic's course and solo flight if student is capable ..... $150.

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A speical inducement to students completing courses: Unlimited solo time on new production planes with air cooled motors $7.50 per hour.

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BOARD AND ROOM $6.50 PER WEEK AND UP

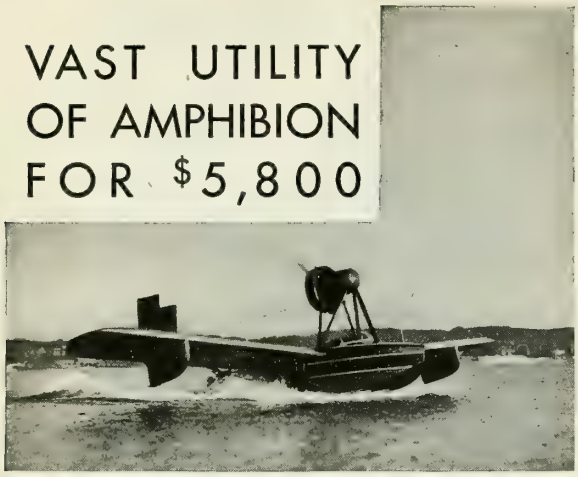
Practical instruction in stock control and aircraft production in the modern Nicholas-Beazley Aircraft factory.

FOR FULL PARTICULARS WRITE THE SCHOOL—160 NORTH ENGLISH ST.—MARSHALL, MO.



38-29-2

VAST UTILITY OF AMPHIBION FOR $5,800



PRIVATEER landing . . . no spray for passengers.
Notice wheels tucked under wings.

PRIVATEER!

PRIVATEER brings to the three great air minded classes . . . flying schools, sportsmen and salesmen . . . the utility and safety of an amphibion at a price several thousand dollars under that of current amphibion costs. PRIVATEER'S price of $5,800 makes it the lowest priced amphibion in the world.

Designed by pioneer makers of amphibions . . . proved service worthy by stiff tests . . . the two place open cockpit PRIVATEER (A. T. C. 370) adapts itself to every conceivable flying and landing condition with a maneuverability that amazes experienced pilots. Combines ease of control with remarkable stability, smart appearance and the *dual safety* and *dual pleasure* of land and water. Flying range adequate for all reasonable needs . . . motor parts extremely easy of access.

A dependable Warner "Scarab" motor of 110 h. p. provides a high speed of 95 miles per hour . . . a cruising speed of 75 . . . a landing speed of 41 . . . a climb of 650 feet per minute . . . a cruising range of 250 miles. All this with a useful load of 600 lbs. . . . performance aplenty!

Naturally, because of its wide utility and low maintenance cost, dealers who sell the PRIVATEER have entry into a vast and comprehensive aviation market. Three other models in the Amphibions, Inc. fleet furnish an amphibion for any purse . . . and the Amphibions, Inc. dealer policy provides a liberal margin of profit on each sale.

For complete information concerning the territorial appointments which are now being made, write

PRIVATEER
$5,800 (Fly-away at Factory)
A. T. C. 370

Weight Empty, 1350 lbs.
Gross Weight, 1950 lbs.

Standard Equipment

Warner "Scarab" 110 h. p.
Wood Pusher Propeller
Heywood Injection Starter
Low Pressure Tires
Fuel Level Gauge
Tachometer
Oil Thermometer
Air Speed Indicator
Altimeter, Tools, Anchor
Rope, Cockpit Cover
Fire Extinguisher

AMPHIBIONS, INC.
(FORMERLY IRELAND AIRCRAFT, INC.)
GARDEN CITY NEW YORK

(*Continued from preceding page*)

dog salesmen on a flying field. They got along because they knew how to make themselves useful, and they picked their profession when they were ripe for it and not when they were too young and green to know what it was all about.

In any business or profession there are only a few—a very few—who knew what they wanted in the days of youth when they wanted everything. Only a few of them picked a career when the picking was good and stayed with it to a successful finish. It isn't any different in aviation, so far as I can see. The useful man is the man who gets along and not the parboiled specialist who hopes for a short cut to success, and the boy who is bound and determined to make himself useful in aviation will eventually find the job he fits. If he learns to fly in the meantime, so much the better, but ten hours in the air don't entitle him to anything under the terms of the trade. They show that his heart is in the right place and his head screwed on securely, but they won't buy him a first-class job in a profession that grows more slowly than he does.

So when one or another of my seven unemployed offspring begin to talk about becoming a pilot—and they will all do it at one time or another—I let them talk but I don't worry much. An ambition toward aviation won't hurt them, for aviation has heroes for their admiration, romance for their imagination and a big enough job on its hands to inspire them with a wholesome idea of working for their living. But though they talk and think in terms of a world with wings, I very much doubt that all seven of them will turn out pilots. If they do, I think I'll turn in my license as a guide and friend of youth and take on an easier job, like riding Niagara in a washtub or raising rattlesnakes for domestic pets.

What they need to know is that a man must make himself useful in this world to be worth the room he takes. If they learn that much, they'll get a job when they need it. The same goes for my boy friend with the fifty-three hours of flying time that nobody seems to want. If he means business, aviation will find room for him, though the opening may not be the one he was looking for when he took his savings out of the bank and went to flying school.

GOOD TIMES ARE COMING

(*Continued from page* 38)

THE year 1930 ushered in the return to the Great Open Spaces, from which many of us had departed during the amazing retreat from dust staged in 1928. What a riot that was! Gentlemen who had spent their lives breathing in the topsoil hurled at them by propellers, turned disdainfully away and hied them to the chaste seclusion of city desks, where they were to sit henceforth making momentous decisions and night club dates. Money was poured upon them—bankers simply begged them to take it—and they rolled about on leather settees, with their big feet adorning soft-cushioned chairs.

If flying went on, they heard of it but seldom saw it—the dust hurt their eyes, now attuned only to the soft light of the better dinner places. Customers for airplanes rushed in—when they could get past the three private secretaries—and implored these lords of the inner air to sell them a ship, in the name of mercy and compassion. Then, alas and alack! The customers stopped coming, the bankers hid in their vaults from the attacks of outraged air stock clients—and 1930 saw the big boys hiking back to the fields, back to where they'd started from two years before.

(*Continued on following page*)

GREATER SAFETY WITH RUSCO GLIDER PRODUCTS



The commercial introduction of RUSCO GLIDER EQUIPMENT marks an important forward stride in the practical advancement of motorless aviation. Designed and perfected by recognized leaders in glider development, these units are manufactured and tested to the rigid mechanical standards maintained for 100 years by The Russell Manufacturing Company. ▲▲ RUSCO *Glider Products* include : the RUSCO *Glider Belt,* which ensures comfort as well as positive protection . . . the RUSCO *Automatic Glider Release,* for uniform, safe launching . . . RUSCO *Safety Leaders* . . . RUSCO *Universal Slings* . . . RUSCO *Tow-Strap Webbing* . . . RUSCO *Aero Rings* for shock absorbing seats and skids . . . and RUSCO A. N. *Standard Shock Cord,* in 3/8" — 1/2" — 5/8" diameter; . . . *Special Glider Cord* : 5/8" and 1". A booklet describing this equipment and its proper use is being prepared. WRITE FOR YOUR COPY TODAY.

THE RUSSELL MANUFACTURING CO

ESTABLISHED 1830

MANUFACTURERS' SALES AND ENGINEERING DIVISION

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RUSCO AERO PRODUCTS

GLIDER ACCESSORIES
FRICTION STRUT
SAFETY BELTS
AERO CORDS
AERO RINGS
BRAKE-LINING
CLOTHS....TAPES
WEBBINGS

MASTERS TEACH YOU TO MASTER THE AIR AT THIS OLDEST SCHOOL



The world's oldest and greatest flying organization and the world's best planes and plant are behind you when you enroll at a Curtiss-Wright Flying School. Here master pilots train you. Here you learn about planes from the world's biggest builders who've spent 20 years training over 4,000 students! That's the record of Curtiss-Wright! Write your name and address on this page and we will give you complete details and a letter to the manager of the Curtiss-Wright Flying School in your locality.

IT'S EASY TO FLY WITH

CURTISS-WRIGHT FLYING SERVICE

29 WEST 57th STREET, NEW YORK

CURTISS-WRIGHT FLYING SERVICE
29 West 57th St., New York City

I am interested in aviation and would appreciate information concerning your flight courses.

Name ..... *Age* .....

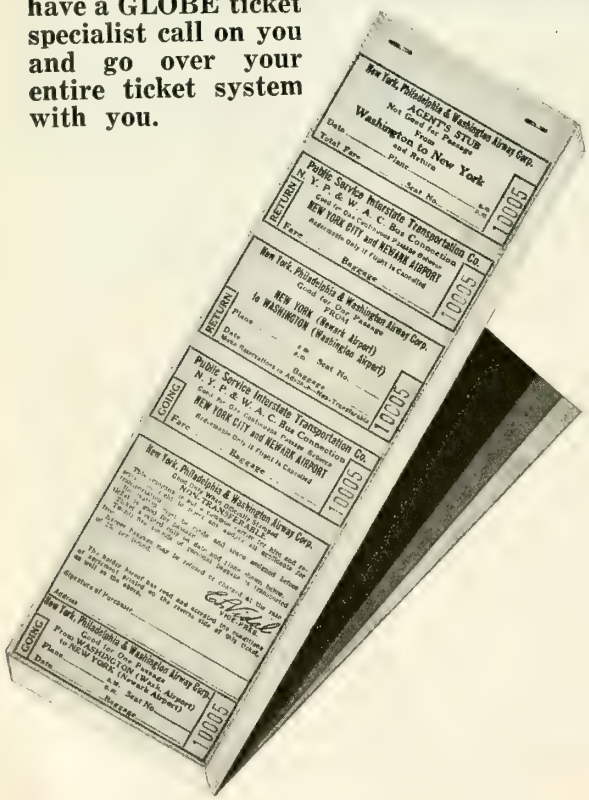
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City ..... *State* .....

AIR-TRANSPORT LINES, too, Turn to GLOBE

GLOBE'S half-century of experience in planning economical and efficient ticket systems for railroad and street lines is proving valuable to aviation companies operating ships over regular scheduled routes. GLOBE planning and GLOBE accurate numbering facilitate the handling of passengers, make accounting easy and assure perfect control even when ticket pads (as is often desirable) are supplied to many agents in hotels, bus terminals, etc.

Stock tickets or special forms printed on GLOBE protective tints. Low prices because of GLOBE quantity production. Write nearest office for samples and prices, stating quantity used. Better yet, have a GLOBE ticket specialist call on you and go over your entire ticket system with you.



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(*Continued from preceding page*)

Not all returned to the fields, however. Along with the real airmen who had dodged the dust, a horde of ex-stock-brokers' clerks, bankers' secretaries, lawyers without clients, presidents' nephews, even waiters who knew somebody topside and had barged and sat down as vice presidents plus fat salaries but minus the knowledge of what it was all about—these returned from whence they had come, and aviation knew them no more. Hangar door salesmen running aircraft factories, simple old pilots posing as master salesmen, cub reporters who became eminent public relations counsel—all decamped and disappeared.

And lo, there was wailing and gnashing of teeth. The cry went forth, "Aviation has collapsed; the bubble has burst; it will no longer support us in a luxury to which none of us were accustomed until last year." Of course it wouldn't. That was one of the many sane things demonstrated in 1930.

ANOTHER influence we happily shed during 1930 was the butcher's boy, stock promoter, gambler, race track tout, or imaginative garage mechanic who formed an aeronautical company of some sort and sold it to the public, during the wild years. These gentry folded their tents, and like Arabs silently stole away last year.

Not all of these promotions were dishonest; in fact, most of them were honest enough, though ill-advised. The public were excited by Lindbergh's flight, and they bought anything a linguistic promoter offered. They will do it again when they again have money.

As the condition will appear again during the coming gradual upward movement, let the aviation stock investor —oh yes, we'll have him again, and some stocks will be well worth buying—let him derive what he can from the following hint:

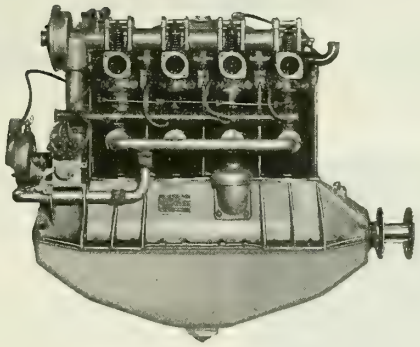
Up to September 30, 1930—the last figures available at this writing—there were approximately 2,760 airplanes manufactured during the first nine months of 1930. There were 296 manufacturers and individuals who had some part in the manufacturing of these planes. And out of this total of 2,760 planes, *thirty-eight manufacturers produced eighty-two per cent.* Therefore out of 296 manufacturing units, all that 258 managed to produce was eighteen per cent. What chance did they have?

Here's how it has worked out in the past, and how it will work out again: A man who has built four or five planes can't sell them, even though he has an Approved Type Certificate for them. He has no selling organization, no standing for his product built up by advertising, no service for the planes if they are sold to a user who doesn't live next door to the factory. The angel who backed the promoter of such an enterprise puts money into the project up to a point where he begins to fear all is not well. The promoter can't sell—yet he *must*. There is only one thing to do—cut the price, and cut it again until someone finally buys. But this is no solution either, for the product has been sold at a loss. However, the backers, if they have money, may continue to produce planes, in their turn to be sold at a loss, until finally the enterprise folds up, a loss to the backers and also a loss to the aviation industry.

You see, this desperate slashing of prices, while it has not kept the little struggling factory alive, has damaged the organization that *could* have produced airplanes at a profit—and unless it can make a profit no concern can remain long in business. The sound, well-financed, well-managed organization, faced by this stupid competition, must lower its own prices, or fail to sell its product. Hence

(*Continued on following page*)

NEW 100 H.P. AIRPLANE ENGINES



For Unlicensed Ships, Wind Wagons, Racing Cars or Ground School Use

●

AT BARGAIN PRICES!

These engines are brand new Hall-Scott 4-cylinder airplane engines, built by the Marmon Motor Car Company for the U. S. Government. They are in their original boxes. They have been carefully stored and are in perfect condition—and the price is but a fraction of what other new 100 H.P. engines would cost you.

Schools can use two or three for lecture rooms, shop work and test stands. Besides their original purpose—for airplanes—the price is so low a dozen uses suggest themselves—ice boats, snow sleds, wind wagons, racing cars, motor boats. Hundreds of enthusiasts have been waiting for an offer like this.

These engines will not last long at our price—so write or wire at once for our bargain price on one or a hundred—whatever number you can use.

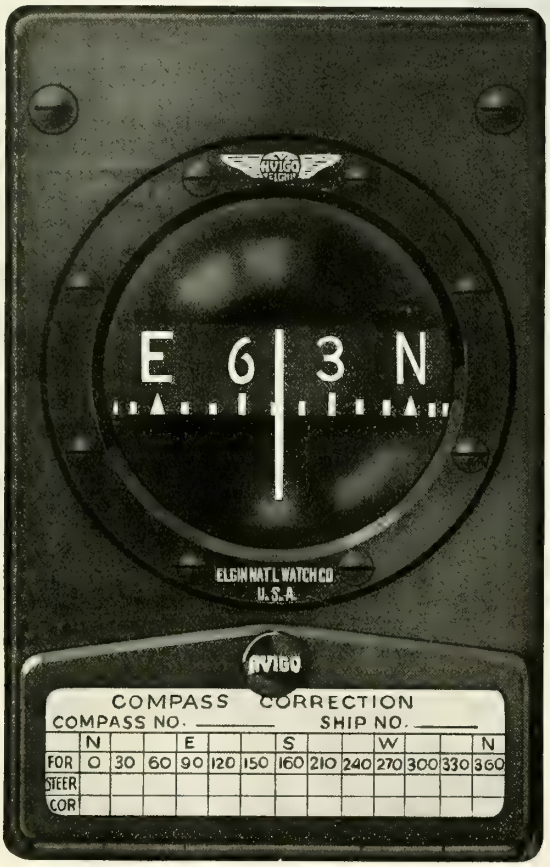
SPECIFICATIONS

Four cylinders, vertical, water-cooled type. Bore, 5¼ inches; stroke, 7 inches. Width overall, 18½ inches; length overall, 49¼ inches; height overall, 40 inches. Weight, 415 lbs. Equipped with two Dixie Magnetos; force feed lubrication. Normal r.p.m. 1450.

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THE Avigo Elgin Compass, a precision-built, accurate instrument for Aircraft. It is light in weight . . . 1.4 pounds . . . legible, card readings magnified, with lens type window. The Compass is easy to use, straightforward, key type compensation, positive locking—correct. Black phenolic composition bowl . . . strong, permanently finished. Price $50.00.

Aircraft Instrument Division

ELGIN NATIONAL WATCH CO.

ELGIN ILLINOIS

New York Office: 20 West 47th Street

(*Continued from preceding page*)

it, too, makes a loss, or fails to make a profit.

The same deplorable condition appears when a large company, misjudging its market, produces more airplanes or engines than there are customers. Then they have to cut prices even below the cost of production, making a loss themselves and causing loss to the well-managed organization that estimated its market correctly—but could not take into account this desperate cut-price competition.

In 1931 we will see less of this ill-judged business of starting out with a few thousand dollars, an idea, one engineer, and a lot of ambition—hoping that from this humble beginning will grow a fine aircraft factory, complete with sales organization, service stations, advertising and publicity—all of which are necessary to the successful marketing of anything—airplanes, automobiles or radio sets.

ANOTHER cheering fact of 1930 was the languishing of the hopes of the limelight-lovers, the intrepid birdmen and birdwomen who simply love to get into an airplane and go places—solely in the interests of aviation, of course. The open season on backers of these ventures in 1928 and '29 had made the game gun-shy. Whereas formerly the determined, nervy, young female pilot had been able to conjure airplanes out of lobsters by means of incantations and the laying on of hands, 1930 saw the lobsters scuttling off whenever a female with a long-distance complex hove into sight.

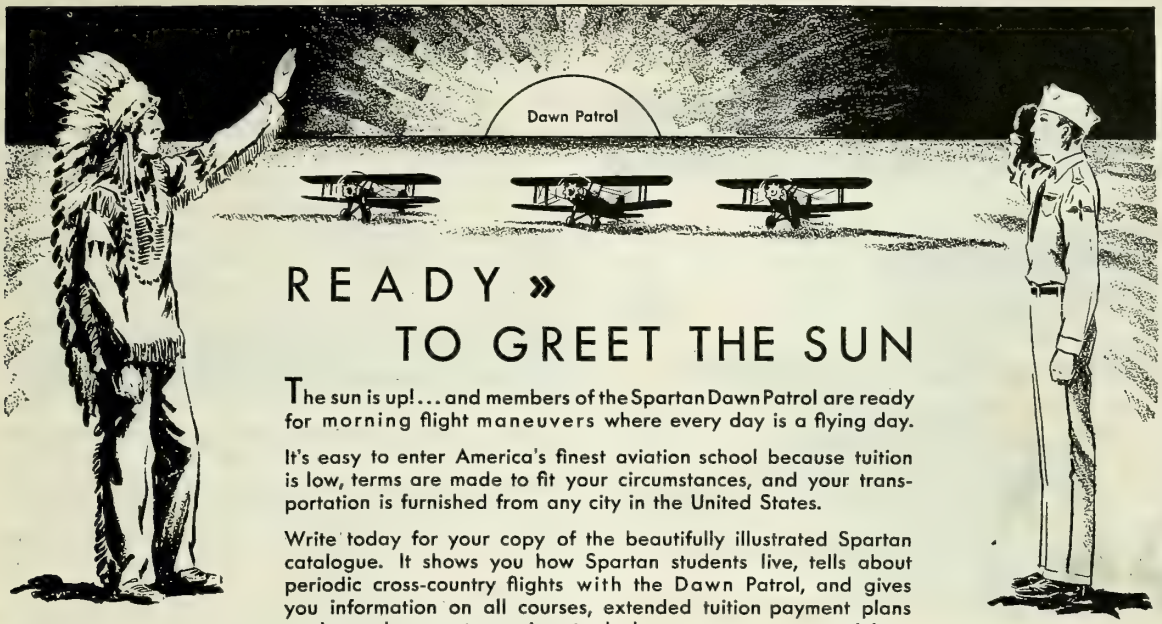
And if the gals had little chance, what chance had the men? I know of at least two dozen bold Columbuses of the air who remain earthbound for the good and sufficient reason that people with money are sick and tired of putting up dough for no better return than that some dough-head may fly off over a stretch of ocean, firm in the hope that the engine will keep on turning.

It has come to be recognized at last that the sole benefit from these ocean flights in unsuitable equipment is the fact that Pilot Dumm and Navigator Dummer got their pictures in the paper, and probably sold the story for a few hundred dollars. But even here, in the story-selling end, 1930 saw a change. The newspapers, quick to note a waning in the public's interest, gave up fighting for the privilege of recounting how some fair damsel flew around in circles. She could tell her story for nothing, or sit there on the island and mumble it to herself, for all the papers cared. All hail, therefore, to 1931 and less air hooey in the papers. We enter now the age of reason in aviation, when romanticism and glamour fade away, disclosing—we hope—a sound business basis of facts, unspotted with too many fancies.

AND the refueling endurance flights! Has 1930 laid these away with tree-sitting? I hope so, friends, Romans, fellow-countrymen. The things are getting in bad odor. In fact, it is becoming recognized that no gentleman should go three weeks without a bath. Speak to me not of wash-rags and pulling down the shades in the cabin plane—gentlemen prefer tubs.

And speaking of endurance flights, until 1930 we had entertained serious ideas of equipping Aeronautical Chamber of Commerce officials and employees with roller skates. Those boys were always on the go—on expense accounts. If it wasn't a conference somewhere, it was a Show—with a big deficit. They used to play a game, "Deficit, deficit—who's got the deficit?" And the Shows would reply with one voice, "*We* have the deficit." Only they were wrong,

(*Continued on following page*)



READY » TO GREET THE SUN

The sun is up!... and members of the Spartan Dawn Patrol are ready for morning flight maneuvers where every day is a flying day.

It's easy to enter America's finest aviation school because tuition is low, terms are made to fit your circumstances, and your transportation is furnished from any city in the United States.

Write today for your copy of the beautifully illustrated Spartan catalogue. It shows you how Spartan students live, tells about periodic cross-country flights with the Dawn Patrol, and gives you information on all courses, extended tuition payment plans and employment service to help you earn your tuition.

Rated by the Aeronautical Branch of the U. S. Dep't of Commerce as a Transport Ground and Flying School—the highest possible government rating.

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Installed in less time and at lower cost than any other type. Tremendous flexible strength withstands landing impact of heaviest planes. Freezing water, settling fills, or buckling of earth due to frost action, will not crack them, or cause sections to pull apart. Extremely durable.

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EDO FLOATS

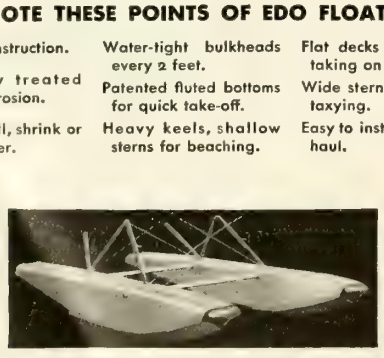


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NOTE THESE POINTS OF EDO FLOATS

All metal construction.
Anodically treated against corrosion.
Will not swell, shrink or absorb water.
Water-tight bulkheads every 2 feet.
Patented fluted bottoms for quick take-off.
Heavy keels, shallow sterns for beaching.
Flat decks for ease of taking on loads.
Wide sterns for perfect taxying.
Easy to install and overhaul.



(*Continued from preceding page*)

because the members of the Chamber had it in the end. You know, if an employee of the Chamber had a sick aunt somewhere and wanted to visit her, he didn't pay out money to go see her. He simply said, "Let's have an aircraft show somewhere—I have a sick aunt there." Upon which another gent would say, "Well, my uncle in Squashville isn't any too well, either; let's have a show *there*, too." So they did, and got their expenses paid. So far as I can learn, the above is the only reason for some of the shows being held. This will be of interest to manufacturers who sent planes to those shows, and went broke all the sooner in consequence. If it hadn't been for Shows one factory I know of could have dodged the receiver for three months longer. It just goes to show.

Well, 1931 sees the end of that foolishness. Now we simply throw ourselves into the hands of Ray Cooper in Detroit and let him put on one Show. It's enough. Detroit is ideally located for the purpose—right across from Walkerville, the home of Hiram Walker—may his soul rest in peace and Canadian Club.

AND the school situation in 1930—who was it wrote Deserted Village? He should have seen the schools. Many a school such as that at the fair town of Do-the-boys-on-the-Hudson moved off into the night, after giving the lads a few airplane rides and getting their money.

The sad fact is that it takes money, much money to make a pilot; and even then he's a slightly green, unripened specimen. The good old days when you took a few lessons, bought a Jenny, and practiced on the customers, are gone forever. Now you really have to know how to fly. Of course, I don't think it's fair—it handicaps pilots like me—but there you are. In order to learn to fly now you have to attend a real school giving a real course. There are several of those, and most of them will survive; the others gradually stole away during 1930.

The outlook is not bright in the schools and will not be bright for some time after other branches of aviation start to forge ahead. The old law of supply and demand got in its fell work here. During 1928 and '29 the lads tumbled over each other in their eagerness to learn to fly. They were so thick around the planes at one school that a young lady who fainted at the sight had to walk a hundred yards before she could find a clear spot to fall down. You couldn't throw an empty pop bottle in any direction without hitting a student, and every second rider in the Subway was studying a correspondence school course in flying—the rest were taking short story writing in six easy lessons.

What an era of production it was! I used to wonder who was going to employ all these healthy young men who yearned for a life in the open, but I didn't say anything. That is, I didn't say it in print, for it wouldn't have been printed. If it had, 2,356 schools would have sued me for maliciously damaging their business. The cry was, "The air needs men." Now the men need air. Also the chance of eating occasionally.

The wild years left us a legacy of 15,000 licensed pilots. Of course, there are pilots *and* pilots. But according to the Department of Commerce, under whose benign rule we live, move and have our being, there are 15,000 of us proudly displaying little yellow licenses to our friends and relatives. We are pilots—God bless our hopeful souls!—and we crave action. Many of us are private pilots; many are sportsmen pilots; many are old fossils like Dudley Steele or myself who fly occasionally but don't work at it. And there are a lot of old wrecks like Jerry McClelland

(*Continued on following page*)

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"Everything on the Ground to keep your plane in the Air"

WHY WATCH OTHERS FLY

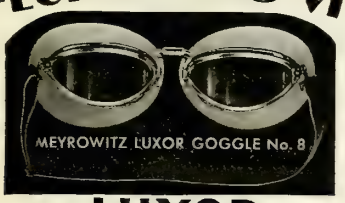


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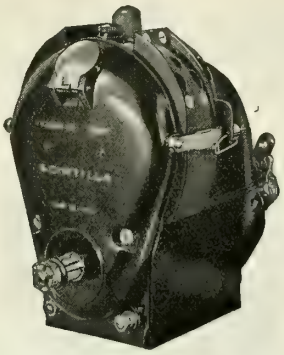
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AERONAUTICAL CHAMBER OF COMMERCE

DEPENDABILITY
SIMPLICITY
ACCESSIBILITY

(*Continued from preceding page*)

flying around in the course of their business, but not flying as professional pilots. Still, allowing for all these vestiges of decrepitude and for great moguls like Walter Beech, it still leaves a lot of young hopefuls with no place to go to work but the Park Central Aviation Grill, as musicians or waiters.

Meanwhile they are growing older, and forgetting all they learned from Walter Hinton except his advice, "Young man, aviation has a place for you." Only, where is it? That's what the young man wants to know. Well, to him and to the new crop coming along this year and the next I'd say, "Don't be discouraged. Wait and pray. Hang on, boys; hang on. I look for more jobs, more airlines, more avition activity in the next few years than most of you even dream of. Meanwhile, work in a bank—and take home all the samples you can collect. That's how I bought my first airplane, in 1915."

NOW, another great fact of 1930 that will have a helpful effect on the future is the gradual education of newspaper editors and reporters. They are learning to differentiate—an expensive word to waste on you six fellows. Translating that one for the benefit of at least five of you, the news lads are learning the difference between useful aviation endeavor and aerial flag-pole sitting.

Day by day purely nut flights are getting nearer and nearer the comic section and the page of household hints. Some of the manufacturers, schools and airlines are getting educated, too. The blaring publicity has largely disappeared, and the public relations man is being allowed to use his intelligence and his former newspaper and publicity experience. The vice president no longer looks in every morning to ask if the latest exploit of some cocky simpleton of a pupil has been broadcast to the world, for no better reason than to get the name of the school into the paper —when an intelligent publicity man would have kept it out rather than get it in, riding on inanity.

Another hopeful fact is that the fight promoters are not looking for material among the airlines this year. You know, in 1930, when the boxing fans got fed up with ham prize fighters who couldn't win except on a foul, the promoters looked around for new opponents who would put on a really determined scrap. And do you know whom they picked out? The airlines. Yes sir, the airlines were putting on the stiffest fights between themselves that had ever been seen in this country. And instead of staging the scrap in Madison Square Garden where they could get a gate, they were actually paying to fight each other.

However, just as the fight promoters were going to sign all the lines up, they merged or combined or swallowed each other, and now all is serene. All they have to fight now is starvation. Instead of eight lines trying to land on each other's jaws, we now have four lines—three transcontinental systems and one to South America. Feeder lines are consolidating with trunk lines, and the way is being prepared for great systems tapping every part of the country. That's the way the railroads started—in little railroads, gradually combining into great systems.

In 1930 we've learned in aviation that we have enough to fight without fighting each other. We have to fight the effects of over-expansion, business depression, public indifference, and the unfortunate remembrance of our own past history—ah, don't overlook the handicap *that* is. We started as an open-air exhibit at a country fair, a spectacle, a circus stunt; we continued as a spectacular war weapon;

(*Continued on following page*)

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Individual Hangars

For Private Planes

Edwards Individual Hangars are built throughout of steel and shipped complete, ready for immediate erection.

Simple in design and rigid in construction, these hangars provide positive, permanent protection from fire, lightning, wind and weather and from carelessness of unauthorized use in public hangars.

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How
RED JACKSON
Made Good In Aviation

Four years ago this young, freckle faced, red headed boy was delivering groceries in a small town. One day, when an airplane flew over his head, Red said to himself, "That's what I want to be—a pilot. I'm young and I could easily learn to fly" . . . That night Red picked up a magazine and read an advertisement of the Von Hoffman Aircraft School. He cut out the coupon and sent it back, came on to school and completed his training. Later he was employed by us as one of our flight instructors. In 1928 he set a record of 417 consecutive barrel rolls. In 1929, in company with Forest O'Brine, he established a world record for an endurance flight of over 420 hours. In 1930 he set the present world's record of 647 hours. In the same year, in Chicago, Red set a new record of 36 consecutive outside loops. Those who know Red say he has gained financial independence through his work in aviation. This reads like a Fairy Tale, but it is true—every single word of it.

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(*Continued from preceding page*)

we came back from the war and again became a show for the yokels; and only during the last few years have we been selling a real commercial service to the country. Folks still think of us as circus men, as war aces, as movie stunters, etc. We've got to make them forget that and see the plain business of transportation we're selling. All of which makes a sizable opponent, without fighting each other.

NINETEEN hundred and thirty pretty well squeezed the wind out of this aviation business. The heroics and the romanticism of the past have proved themselves merely interesting, and not good business. Even the fevered brows of the super pilots are cooling, and they are settling down into jobs. Flying, at least on the airlines, is safer today than it was a year ago—much safer. Thanks largely to the safety campaign inaugurated by Major Reed M. Chambers of the United States Aviation Underwriters, Inc., and so effectively carried on by pilots themselves, there is a changed attitude toward the desirability of pushing through bad weather, toward stunting, and circus stuff generally. We have actually learned that there is no profit in killing passengers, no sense in killing ourselves; and that pursuit squadron tactics of bravery do not work on large airlines.

There is another phase of this situation that makes me feel very certain that we are entering an era of most sound aeronautical development, and that is the Naval and Military situation, and its bearing on commercial aviation. But I must defer all discussion of that to a later article, although it is in no sense a separate topic. Commercial aviation is dependent for its Federal support on the Government's recognition that it is the necessary foundation and source of supply for our aerial defense in time of war. Or, in other words, in time of war our Naval and Military aviation will be dependent to a large extent on commercial aviation. Details later.

AND now it is quite useless for me to tell you the name of this new Moses who is to lead us into the promised land of healthful prosperity, for you've spotted him yourself and know that his other name is plain old Common Sense. It is indeed a pleasure to welcome this wise and dignified gentleman to our midst. Unobserved by many, he has been with us for a year, exhorting us to follow him.

Many have done so; others yet lag behind, doubting that he is the right prophet to lead us. Friends, there *is* no other. We have followed bold Heroics; we have followed raucous Romanticism; we have followed Over-Statement and bellowing Boaster. Now let's follow Common Sense for a little while—and a great change—and see just where he will lead us.

THE PILOT AND HIS AIR SPEED METER

(*Continued from page 49*)

speed of a plane increases with the altitude. This increase in stalling speed of a plane keeps pace almost exactly with the under-reading of the air speed meter with increased altitude so that a plane which stalls at sea level when its air speed meter reads, say, 52 miles per hour will stall at that same meter reading regardless of altitude. Hence if the pilot always maintains a reading greater than his take-off speed per air speed meter, he eliminates the possibility of a spin.

In this connection pilots should remember that while

(*Continued on following page*)

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This Winter Season, when unfavorable flying conditions keep your ship on the ground, is the ideal time to do your overhauling and repair jobs. The new prices in our new catalog "J" make these jobs possible at lowered costs to you.

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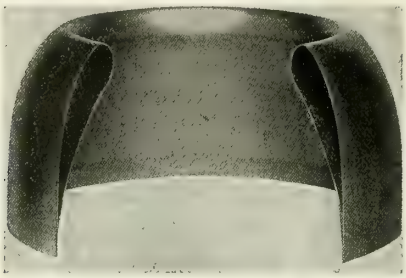
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(*Continued from preceding page*)

the recording part of the air speed meter is before them on the instrument panel, the measuring part of the device is frequently mounted considerably off the center line of the plane. In straight flight all parts of the plane are moving at the same speed relative to the body of air through which the plane is traveling. But in sharp turns the measuring part of the air speed meter is moving, relative to the air, at a rate that may differ by as much as five miles per hour from that of the fuselage. When the measuring device or the head is on the inside of the turn, the plane is moving faster than the indicated air speed. But on the other hand, if the turn is made in the opposite direction, the air speed meter may register a speed greater than the actual. Hence, in sharp turns at close to stalling speed too much dependence should not be placed on the indications of the air speed meter.

A pilot's first and greatest need is five miles more than stalling speed.

With respect to maintenance of the air speed meter, there is so little for the pilot to do that that trifle is frequently neglected. Care should be exercised to see that the measuring head or tube points directly ahead and is not bent. Rubber joints in tubing cause trouble if allowed to deteriorate and should be inspected periodically. Piping should be disconnected occasionally from both the gauge and the head ends, and blown through to eliminate moisture from condensation and to detect obstructions. If the head end is disconnected and the pilot blows *very* gently down the pressure tube until the indicator reads about 80 miles per hour and then pinches the rubber tubing or stops the end of metal tubing with a finger, a rapid falling of the pointer will indicate a leak. Similarly, by sucking on the suction tubing, the presence of air leaks in that system may be detected. This sucking and blowing test may be applied to the gauge itself becaue sometimes the rubber sealing the case is not maintaining an air-tight joint. All of these tests should be performed with great care, for too great a pressure or suction can very easily ruin the instrument.

THE AIRLINES OF MEXICO

(*Continued from page* 86)

numerous applications for concessions to operate in various parts of Mexico. Groups making applications are financed by both Mexican and American capitalists.

The airlines in operation in Mexico today are not without the most excellent service and equipment. Safety has been the watchword of the operators in that country, and considering the mileage of all the airlines and the character of the terrain over which they fly, the number of accidents is amazingly low. The planes, which are carefully checked and kept in perfect condition, always run on schedule time. Large and well-equipped airports have been constructed at the cities where the planes land regularly. The new civil airport at Mexico City has recently been completed. With its three hard-surfaced, 132-by-4,000-foot runways, and its very superior drainage system, it stands today as one of the finest on the continent. A large hotel-station, the construction of which is nearing completion, will provide the air traveler with every convenience.

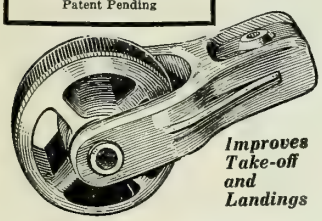
The network of airlines, multiplying so rapidly throughout the Republic, brings the Mexico City days nearer to the metropolis of the world. With military, as well as commercial planes frequently flying overhead, the inhabitants of the small Indian villages no longer fall upon their knees in prayer at the sight of a soaring plane.

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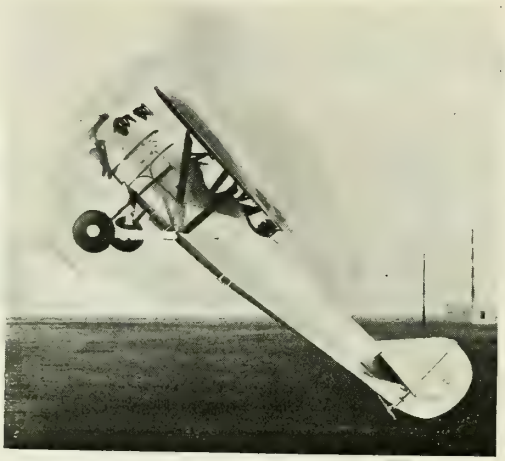
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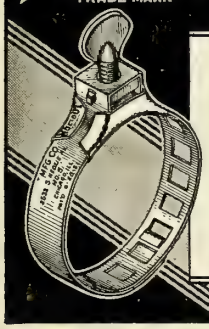
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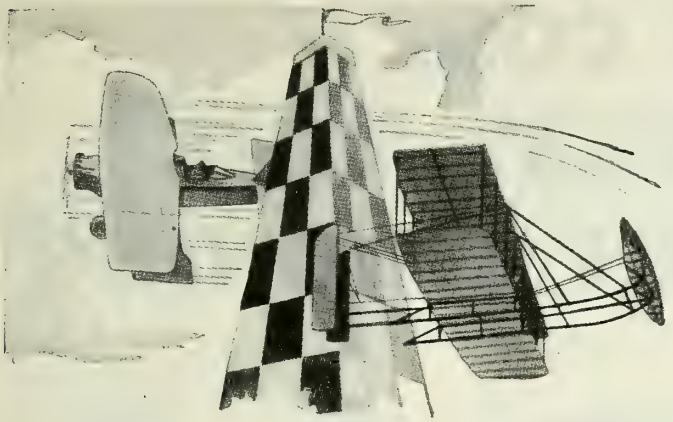
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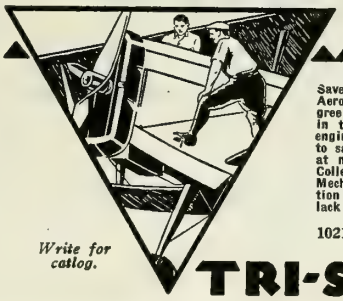
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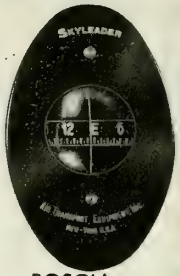
Hisso s, OX5's, Panthers, K6's, and a number of 30 H.P. motors, all in running condition, DIRT CHEAP. All kinds of Glider equipment. Big stock of airplane tires and wheels. If it is anything connected with war time airplanes I HAVE IT. I ALSO HAVE CIRRUS MOTORS DIRT CHEAP.
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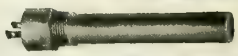
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Oil heater to warm the oil right in your tank. Just plug in, in 20 minutes your motor is ready to fly. In ordering specify motor, type of airplane and size of drain plug.

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TAIL SKID, FOR WACO, BIRD, ETC.
BEST SILICON MANGANESE STEEL
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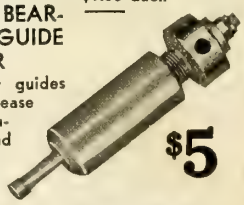
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FITS WACO, BIRD, AM EAGLE
FITS TRAVEL AIR, EAGLE ROCK, ETC.
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AERO FEELER GAUGE
6" long 45° bent ends
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PHENIX NITRATE DOPES

Clear, $1.20 in 50 gal. barrels.
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$1.50 in 5 gal. boxed cans.
Pigmented $2.20 in 5 gal. boxed cans. Yellow, Blue, Red, Green, Cream, Khaki, Aluminum, Black, White.
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POSITIONS WANTED

FORMER ARMY Air Corps Instructor, 7 years experience, licensed as approved ground school instructor on airplanes, meteorology, navigation, parachutes and engines. Also teaches Air Commerce Rules & Regulations, instruments, radio. Desires position as manager or chief instructor. Also understands the advertising business. Best references, AERO DIGEST, Box 1060.

YOUNG MAN desires position or financial assistance in procuring solo hours. Age 25, height 6 ft. 3"; go anywhere. Will consider any proposition. AERO DIGEST, Box 1063.

AERONAUTICS SALESMAN: Successful commercial salesman with transport license; 450 hours; all types, land and seaplanes. Naval aviator, college graduate, age 27, single. Unqualified references for both selling and flying. AERO DIGEST, Box 1059.

SITUATION WANTED: Auto mechanic and welder. 15 years experience. Wishes to change to aviation. Age 31; married. Will go anywhere. Start at low salary. Graduate Aviation Institute of U. S. A. AERO DIGEST, Box 1058.

WILL FLY any type ship during winter just for the ride. I have had 200 hours. Ship must be near here. Remsen, 65 Headley Terrace, Irvington, New Jersey.

AIRPORT CONNECTION WANTED: 35 hours in different type ships, have sold courses, hustled passenger hops, five months ground school. Experienced in carpentry and steel erection. Age 30, married. AERO DIGEST, Box 1056.

LICENSED A and E MECHANIC. War time experience. All types land and seaplanes. Desire connection as instructor, supervisor or foreman, preferably on Pacific Coast or in Southwest. AERO DIGEST, Box 1055.

GRADUATE U. S. Special Service Schools, Chanute Field. Instruction Primary Flying Schools, Brooks Field. Licensed A & E mechanic. Familiar with OX5, Kinner, Hisso, Wright. Experienced aircraft welding, weaving, dope and fabric, metal, organization. AERO DIGEST, Box 1057.

POSITION WANTED in engineering department, as draftsman, stress analysis calculator, or project engineer. Graduate doctor of N.A. and M.E. Four years' experience in construction and design of land planes. Supervised engineering department; have done stress analysis and aerodynamic calculation, etc. Willing to go anywhere. G. P. Casiraghi, care of The Shirley, 3305 West Avenue, Newport News, Virginia.

POSITION WANTED: With airport, transportation company or school, preferably in East or Central U. S., in servicing, receiving, ordering, storing or shipping department. Age 28, married. Graduate Springfield Technical High. Five years experiencing Hydro Electric Construction, field storekeeping. Completed course in practical aviation. AERO DIGEST, Box 1061.

L. C. PILOT, 25 years old. Parks Air College graduate, desires position. Can furnish best references. Will go anywhere. Can speak fair Spanish. AERO DIGEST, Box 1067.

Two Courteous, highly experienced Pilots with ships, offer for $280 a beautiful Air Cruise of 3000 miles, starting from Youngstown, Ohio, in February, covering Southern states with stops at interesting points and for golfing, theatres, dancing, fishing or whatever. Also available for advertising tours, student training, charter trips, etc. Wire or write, C. S. Hanson, 425 W. Judson Ave., Youngstown, Ohio.

GIRL PILOT, student Marshall Flying School, approximately 35 hours solo. Have Private Pilot's license. Willing to work for living expenses if proposition has future, in order to build flying time. Will go anywhere. Barbara S. Poole, care Marshall Flying School, Marshall, Missouri.

TRANSPORT PILOT: Single, 21, night and cross coumtry experience. Any type plane, open or closed. Will go anywhere. Salary secondary consideration. AERO DIGEST, Box 1065.

Experienced engineering group desire connections with well financed company or finance for newly developed project. Have 4 A.T.C.'s. AERO DIGEST, Box 1066.

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If you're looking for a position

OR

If you have a position open

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ALTHOUGH the regular rate for advertising on these pages is 10c per word, with a minimum charge of $2.50, we are publishing POSITIONS WANTED and HELP WANTED advertising for only one dollar. Please confine your copy to approximately twenty-five words.

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THIS $1 rate is, of course, only temporary, but shall remain in effect until the employment situation in the aviation industry returns to normal.

POSITIONS WANTED

GRADUATE of Pennsylvania State College, Mechanical Engineering. 3 months with Lycoming, 14 months with aero-engine test lab, Naval Aircraft Factory. Experienced in running, tear down and inspection of aircraft motors and accessories. Age 26, single. Desire connection in eastern U. S. or Canada. Prefer experimental or manufacturing work. Ralph L. Cope, 126 S. Patterson St., State College, Penna.

TRANSPORT PILOT, 2000 hours. Barnstorming, instruction, cross-country and airline experience in U. S. and Mexico. Also experienced in factory work, holding mechanic's license. Have F.A.I., Sporting and Mexican licenses. Good executive and salesman. Age 30, married. Pilot, Tyler Hotel, Oak Cliff, Dallas, Texas.

YOUNG MAN, desires position as mechanical draftsman. Good education, thoroughly experienced in mechanical drafting, detail, layout and design. Also experienced in stress analysis of all metal construction. Excellent references, free to go anywhere. Donald Burnette, Sparta, Wisconsin.

YOUNG MAN, 18, high school graduate, one year college, one year of mechanics, desires aeronautical connection for salary or training. Available immediately. Ken D. Rose, 1130 West 8th, Hastings, Nebraska.

ENGINEER: Two years, present aircraft company. Ten years experience. University trained. Chief responsibilities. Feature designs, stress analysis, all calculations. Married, four dependents. High character. P. O. Box 884, Glendale, Calif.

EXPERIENCED PILOT and SALESMAN: Flying since 1910. First airplane salesman. Have done primary layout work; experimental research work; wind-tunnel, designing; drafting; construction; assembly; rigging; inspection; repair and maintenance; flight testing; sales engineering; appraising; investigation; demonstrating; organizing; executive and sales work, etc. I have as wide an experience as any one man in this industry. Here's more than twenty years experience. Can you use it? AERO DIGEST, Box 1062.

YOUNG MAN, 19, high school education, wants work for aviation ground training. Can go anywhere. Myron Barkhurst, Box 17, Jewett, Ohio.

High School Graduate, 21, wants work in factory, hangar or on airport Experience primary, salary secondary. Will go anywhere. Geoge Mognusson, Lansing, Iowa.

LICENSED AIRPLANE MECHANIC: Age 20. Twelve years theoretical experience, three practical. Excellant assistant to any man on any airport from mechanic to airport manager or weather forecaster. Good references. R. D. Adams, 33 Crosby Ave., Kenmore, N. Y.

GRADUATE ROOSEVELT A & E Mechanics School. 2 years high school. Willing to do parachute jumping. Prefer southwest or South America. R. Wurfer, Jr., 370 Ft. Washington Ave., Manhattan, N. Y.

TRANSPORT PILOT, licensed mechanic. Manager of branch school, later chief instructor home school. 500 hours on all types. Instruction, cross-country, barnstorming and airline co-pilot experience. No crack-ups. Age 23, single, good references. Robert M. Norris, Marquette, Kansas.

POSITION WANTED: Desires connection with airport or manufacturer to learn Aviation. Age, 22, single, high school education. Will go anywhere. M. C. McQueen, 4611 Fourth Avenue, Brooklyn, N. Y.

PRIVATE PILOT wants position with pay and flying time. Age 24; two years college, five years experience as salesman; really interested in making aviation a business. D. M. H. Box 876, Stamford, Conn.

EXPERIENCED A and E mechanic desires connection with private party or newly formed airline. Nine years experience as airplane mechanic on all types land and seaplanes. Also experienced on J5, J6, Cyclone, Wasp, Liberty, Hisso and OX5 engines. Capable of inspection, detail factory work and general field inspection. Prefer large ships. 26, single, willing to go anywhere. Lyndon N. Mooney, R. D. 1, Nedrow, N. Y.

POSITIONS WANTED

YOUNG MAN, 23, with 5 years experience as parachute jumper, rigger, instructor, desires position with school or company. Will exchange work for 3 place ship. Also willing to work about ships and hangar. References. Clem M. Mervis, W. Griswold Road, Elyria, Ohio.

HIGH SCHOOL GRADUATE desires position on airport or in aircraft factory in exchange for mechanical and flight instruction. Have chauffeur's license. Age 18. Paul E. Marston, 3 Morrison St., Manchester, New Hampshire.

TRANSPORT PILOT, 8 years' experience on all types planes and engines. Over 2500 hours logged. Licensed airplane and engine mechanic. Much cross-country experience. Experienced operations and service chief. Willing to go anywhere. Best references from past employers. Will accept co-pilot job on tri-motor if chance for advancement. AERO DIGEST, Box 1070.

U. S. RESERVE OFFICER, age 34, single, over 800 hours, all types planes. World War pilot officially accredited with four German planes. Technical graduate with several years' engineering experience. Prefer flying or engineering position but will consider a connection of any kind in aviation. AERO DIGEST, Box 1071.

GRADUATE Von Hoffmann Aircraft School, 1A rating. Age 32. Desire to build up required hours for Transport license. Will work for small salary. Excellent references. AERO DIGEST, Box 1069.

MECHANICAL ENGINEER and Draftsman (U. of P.) Understand aerodynamics and theory and practice of airship design. Initiative and inventive ability. Have valuable improvement plans for airship and Diesel engine design. Prefer connection with airship or engine builders. Excellent references. Oliver B. Finn, M.E., 1620 N. Nevada Avenue, Colorado Springs, Colorado.

TRANSPORT PILOT: Class 1A, 300 hours solo time; 250 hours passenger carrying and instruction. 25 years old and married. Will work reasonable. H. Hale, 3323 Warren Ave., Chicago, Illinois.

MECHANIC desires position with barnstorming pilot as wing-walker and chute jumper. Can do delayed drop, break away. Erwin Mathews, 1140 Harrison Avenue, Crystal Falls, Michigan.

COMMERCIAL PILOT, 165 hours, airplane mechanic's license, high altitude and cross-country flying, welder with production and experimental factory experience, best references, 23, sober and clean record. Will accept any fair offer anywhere. R. W. Conner, Whitefish, Montana.

AERIAL PHOTOGRAPHER wants position. Four years experience as camera man, mosaic man and laboratory manager. Capable of student instruction. Excellent qualifications and recommendations furnished. AERO DIGEST, Box 1078.

SALESMAN: 1½ years experience on road, covering airplane manufacturers selling accessory equipment. Also experienced on production and welding inspection. Interested in sales and development work having worthwhile future. AERO DIGEST, Box 1080.

YOUNG MAN, 22, wishes connection with some airport or factory. Wants chance for advancement. No drifter; little experience. Can go anywhere. AERO DIGEST, Box 1083.

TRANSPORT PILOT: Over 300 hours experience, barnstorming and giving instruction. Good education, age 32. Will go anywhere. Prefer Northwest or South. AERO DIGEST. Box 1082.

TRANSPORT PILOT: Over 3300 certified hours, 700 on Wasp Fords and Sikorskys'. Until recently with large transport company. Rated on all types; night and air mail experience; working knowledge of Spanish and leading European languages. Proven record; no crackups. Age 34, single and always sober; desires a responsible connection. AERO DIGEST, Box 1032.

TRANSPORT PILOT: 230 certified hours. Single, 25. Thorough knowledge Spanish. Working knowledge of French, Portuguese and Italian. Holding Class 1A and 2C ratings. Cabin and night flying experience. Clean record, good appearance. 2 years college. Business experience. Highest class references. Desire flying position; available immediately. AERO DIGEST, Box 1084.

YOUNG MAN, 23, wants to learn airplane and engine mechanics trade. Willing to work for expenses first year. Can give best references including those of present employer with whom he has been connected over six years. Mechanic, P. O. Box 120, Summerville, South Carolina.

LICENSED A & E MECHANIC. Two years' experience. Desires position with responsible firm or individual. Willing to go anywhere, United States or Foreign. Merle G. Smith, c/o Gail Bailey, Grant, Nebraska.

POSITIONS WANTED

L. C. PILOT, 100 hours. Received instruction from Army and Navy trained men. High School and two years College. Age 22 Will go any place. Ralf W. Henson, 4548 Flora Avenue, St. Louis, Missouri.

LICENSED A & E MECHANIC: 4½ years Army Air Corps, 1½ years commercial aviation. Graduate Army Air Corps Technical School as crew chief. Excellent references as mechanic, field welder, rigger, engine inspector, shop foreman and instructor. Would like connection with private owner. A. G. Breton, 367 Beech Street, Manchester, New Hampshire.

PARACHUTE JUMPER: 17, can go anywhere and would like connection with large airport. Will jump as many times a day as wanted. Have exhibition Irvin back pack. State all particulars in first letter. AERO DIGEST, Box 1072.

HARVARD BUSINESS SCHOOL student, Stanford graduate, naval aviator, transport pilot with 250 hours Navy time, desires connection in commercial aviation after June 15, pilot or office work, preferably in transport aviation or business side of commercial aviation. Age 25, unmarried. Will go anywhere. AERO DIGEST, Box 1074.

PILOT: 370 certified hours open and closed planes, no crack-ups. Cross-country and night flying experience. 75 hours instructing. Unlicensed, 30, single, can go anywhere. Salary secondary. J. F. Cunningham, R. F. D. No. 1, Mulberry, Tennessee.

AIRCRAFT SALESMAN, Executive, excellent sales record and proven ability. Desires connection selling planes. Wide knowledge organizing distributors and dealers; can instruct. Cross country flying experience. Best references. Transport license. Jack Duelks, 1254 S. Citrus, Los Angeles, California.

Licensed Repair Man; experienced in all branches on modern ships. Business and technical training. Run own shop. Sober and reliable. Go anywhere. AERO DIGEST, Box 1073.

PIONEER TRANSPORT PILOT. Over six thousand authentic flying hours, fifteen hundred on trimotor transport types, five hundred night flying. Graduate four of world's finest flying schools, including British Royal Flying Corps, U. S. Navy and U. S. Army. Primary and advanced pursuit ships, both landplanes and seaplanes and flying boats, single and multi engines. Also licensed radio operator and steamship navigator. Desire position with reliable company, either flying or in executive capacity. Will go anywhere. Lieutenant Commander Geo. R. Pond, 2975 West Chicago Blvd., Detroit, Michigan.

LICENSED AIRPLANE MECHANIC, age 20. Have worked on rebuilding of all types light planes and on several experimental types. Specialize in wing work, but also do work on fabric and doping, as well as rigging and general repairs. Willing to go anywhere...Excellent references. Albert L. Plagge, P. O. Box 132, Parrish, Florida.

STUDENT PILOT, 23, sober, intelligent; High school training; 4 hours' dual instruction; 4 years as automobile mechanic. Desire position with airport factory or individual as mechanic with the opportunity to learn to fly. Will do parachute jumping if required. Go anywhere; best references. L. K. Williams, Route 1, Bedford, Iowa.

POSITION WANTED: Desire connection with airport engineering company or in engineering department of aircraft manufacturing company; 28; graduate University of Mississippi, School of Civil Engineering; completed ground and flying course; five years experience miscellaneous civil engineering work. AERO DIGEST, Box 1038.

TRANSPORT PILOT: Desires position, tri-motor or single motor cabin; over 2500 certified hours. Past two years mail and passenger line flying. Age 33, married, very best references. AERO DIGEST, Box 1076.

USED PLANES AND MOTORS

FOR SALE: Travel Air 6 place cabin monoplane type 6000B with J6-300 motor; also rest room. Has had but 76 hours. Price, $10,000. You save over $4,000. Ward S. Lent, Poughkeepsie, N. Y.

REBUILT CURTISS OX5, OXX6 and Hisso engines. Aeronautical engine machine work. Send for new catalog. Authorized Kinner service. Heckman Machine Works, 4026 West Lake Street, Chicago, Ill.

BRAND NEW J-5 Taper Wing Waco, special paint job. Completely equipped. Had 20 hours. Will sacrifice for $5,000. Also Cavalier, 2-place cabin monoplane, flown 35 hours. $1,500. G. W. McCauley, Hangar 21, Roosevelt Field, Garden City, N. Y.

FOR SALE: Licensed Monocoupe, 60 H.P. Velie motor, 137 hours, A1 condition; overhauled just eight hours ago; straight axle. Only flown by private Chicago owner. Best offer takes it. AERO DIGEST, Box 1016.

USED PLANES AND MOTORS

FOR SALE: French built four-place Viking Flying Boat. Latest model 180 French Hispano motor just overhauled. Air starter, built in fire extinguisher, complete set of instruments. Plane and motor in perfect condition. 100 hours. $7500. L. H. Fales, P. O. Box 4502, Miami, Florida.

CURTISS JN4D, with OX5 and Curtiss-Reed steel propeller, good condition. Price, $375 Chas. J. Happ, Doylestown, Penna.

CURTISS MOTORS: For immediate disposal, a limited number of new OXX6 and government rebuilt OX5 and OXX6 motors way below market prices. All motors in original government boxes and have not been used since purchased directly from the government. Also new spare parts. Get our quotations. Aero Motor Sales Co., 500 East Jefferson, Detroit, Michigan.

FOR SALE: OX5 Long Wing Eaglerock in damaged condition; can be repaired. Has had license and flown 170 hours. $400 complete; $250 less motor. P. O. Box 103, Hillsgrove, R. I.

Travel Air NC 9948, Millerized OXX6, Bosch mags. Ship 85 hours; motor 35 hours. Will trade. Want late Monocoupe, Lambert powered. Also have OX5 only 50 hours; new overheads complete overhaul. Will sell or trade for steel prop. All inquiries answered. Laurence J. Aubry, Priscilla Theatre, 330 Summit Street, Toledo, Ohio.

FOR SALE: OX5 Waco 10; new Hamilton-Standard prop. Cheap for cash or will trade on Lambert Monocoupe. Clifford W. Ludwig, Cor. Grand Ave. and Forest, Wausau, Wisc.

HEATH PARASOL HENDERSON motored. Good flying condition; welded front section fuselage with new split type landing gear. Best offer takes it. Anthony Tederson, 237 Vale Street, Watertown, N. Y.

FOR SALE: American Eagle monoplane, Velie M5 motor, in damaged condition. Information on request. $450 flyaway, Lynchburg, Va., John H. Beahm.

FOR SALE: Six-place J5 Stinson Detroiter, $3500. OX5 Waco 10, $1100. Both ships like new, with license. West Bros. Air Service, Route 1, Menasha, Wisc.

FOR SALE: Waco model 150 powered with converted Wright Hisso motor. Excellent condition, like new. Extras including booster starter, luggage compartment, clock, center section tank. Completely equipped for night flying. A real all-purpose ship at a real bargain. Price, $1,900. Robbins Flying Service, Akron, Ohio.

WHERE TO BUY: Thousands used, surplus airplanes, engines, supplies. Airplanes low as $250. Sport plane engines $25. Power Gliders, Propellers, Jumping Balloons. Tires. Wheels, $3.50. Hubs, $1. Send 50c for Buyers Directory Catalog. Midwest Co., Dept. H, 603-5 Security Mutual, Lincoln, Nebr.

AMERICAN EAGLE, 3 place Kinner motor, 96 hours, in good condition. Dual controls, compass, many extras; real bargain at $1350. Must be seen to be appreciated. Wire or write, R. Lessard, 109 West 111th Street, New York City.

LYCOMING, Wright, Cirrus, Challenger, LeBlond, Lawrence, Liberty, Hisso, Velie, Walter, Anzani, Dayton Bear, Siemens-Halskie, Tiger, Gypsy, Warner, Hallet, Kinner engines cheap. Karl Ort, York, Penna.

FOR SALE: Airplanes, the best buys in the United States...Two J4 Whirlwind Wacos, new last spring, and one J5 Whirlwind Waco. All with steel propellers and Heywood air starters. One OX5 Waco 90; also two OX5 Travel Airs. These ships were recently licensed and are priced to sell quick. Terms to responsible buyers. Write or wire Becker-Forner Flying Service, Inc., Jackson, Michigan.

IRELAND AMPHIBIONS: Two, both now operating and in excellent condition; each a five-place ship complete with Wright J5 motor and quickly raised and lowered landing gear. Price each $5,000 cash. Reply AERO DIGEST, Box 1075.

FOR SALE OR TRADE: Two J5 Wright Whirlwind motors, same as new, completely overhauled by Wright service, no time since overhaul; with Hamilton propellers and Eclipse Inertia starters. Price, $1200 each. Will consider trading one for good licensed airplane. Write or wire Michigan Aero Motors, Jackson, Michigan.

FOR SALE: Model F Waco Warner demonstrator with Townend ring, Heywood starter, air speed and a brand new Switlik parachute, $4,000. New York Aircraft Distributors, New York City Airport, Flushing, N. Y.

FOR SALE: Eaglerock OX5 licensed and in perfect condition with free flying instructions, $800. New York Aircraft Distributors, Inc., New York City Airport, Flushing, N. Y.

FOR SALE: Standard J1, OX5 motor, ship rebuilt and motor overhauled. Cheap for cash, if taken at once. H. H. Brindley, Peabody, Kansas.

J5 MOTOR, less than hundred hours; excellent condition, never been overhauled. A real bargain at $1200. Also J5 Hamilton metal prop at $150. Hamilton Metal J6 prop at $150, the latter suitable for any Lockheed or speed job. Northern Airways, Wausau, Wisconsin.

USED PLANES AND MOTORS

NEW PRODUCTION Sport Planes with split landing chassis, welded fuselage and tail groups, completely finished, ready to fly, only $395, motor extra. Ten cents brings full information. Hibbs, Fort Worth, Texas.

AIRPLANES $500 UP. We have airplanes in every state. Write your needs. No doubt we have just what you want at the price you want to pay. Pioneer Airplane Sales Service (20 years in aviation) Airport, Syracuse, New York.

FOR SALE: One English Mark II Cirrus, total time 41 hours, certified, perfect, looks like new. World's best known light engine, $385. Chas. Snyder, Lockport, Illinois.

FOR SALE: Ace airplane engine with prop. 25 H.P., good shape, price, $50. Wm. Sangford, Cambria, Iowa.

FOR SALE: Two place cabin monoplane, covered, wing span 39 feet, less engine and tail surfaces, $110. Edward Kuszzak, 126 S. Franklin St., Chicago, Illinois.

ENGLISH AVRO AVIAN, Cirrus motor, Mark III. Slotted wings, Goodrich low pressure tires and wheels, NC license, 120 hours, like new. Price, $1600. Or will trade for a three place open ship, late model. No OX. Courtney J. Rogers, Bridge Hampton, L. I., New York.

FOR SALE: New Standard Trainer Model D-29-A. 140 hours. Thoroughly overhauled and in excellent condition. Price, $1800. Communicate with Clark - Rogers, Inc., 110 Monmouth Street, Gloucester, New Jersey.

HEATH PARASOL complete with twin motor, propeller and 20 x 4 wheels, tires and tubes. Crated for shipment, $390. Leon A. McFarlane, 1108 S. Fifth Street, LaCrosse, Wisconsin.

NEIUPORT PLANE with new nine cylinder Gnome motor; two extra lower wings, uncovered. All for $150 complete. Also 1 new Gnome nine cylinder motor, less mags, $50. H. M. Matthews, 5239 N. 6th St., Philadelphia, Penna.

FOR SALE: New inverted in-line Argus engine, four cylinder, air cooled, 80 HP, 1930 model AS8. The foremost European light engine. Brand new in crate, $750. Menasco Motors, Inc., 6718 McKinley Avenue, Los Angeles, California.

NEW OX5 Swallow two place trainer. Assembled at factory November 1st. Licensed, $1,250. Accept late Ford or Chevrolet, terms on part of balance. Cosby Harrison, Crossville, Tennessee.

FINE 36 HP Flying Flivver sportplanes $300 to $350. Flying condition guaranteed. If you mean business, wire. No letters answered. N. E. Storms, Spartanburg, S. C.

SCORPION 34 HP 2 cyl. engine with Hamilton Standard Propeller for pusher plane. Brand new. Never installed. Price reasonable. Stout Engineering Laboratories, 400 Dearborn Building, Michigan.

FOR SALE

SENSATIONAL new steel tube fuselage fitting for sportplanes. Completely finished, no bending, cutting or welding necessary. Saves 75 per cent labor on steel fuselage. 30c each, one with circular 25c. Get the Sportplane Constructor containing blueprints, drawings, photos, full instructions for building sportlanes, $1 postpaid. Russell Aircraft, Box 455, Toledo, Ohio.

LIGHTPLANE OWNERS & BUILDERS: Largest and most complete, reasonably priced stock of lightplane parts and supplies. Sales, Service, Parts for the famous Cleone engines; rebuilt 20 to 50 h.p. lightplane engines. Knockdown airplanes and gliders. Blueprints. Send 10 cents for catalogue of everything for the light airplane. Lightplane Supply Co., 5366 Cabanne, St. Louis, Missouri.

BARGAINS in motors, propellers and hubs for light-planes, iceboats, and snowsleds. Harleys, Hendersons, Aces, Fords and Chevrolets. Circular 10c. Storms Aviation Co., Spartanburg, S. C.

WINGS FOR SALE: New and secondhand for Waco 10, straight and taper, prices very reasonable. Diaz Aeroplane Shop, Charles & Lewis Ave., Floral Park, L. I.

FOR SALE: New Heath Henderson welded fuselage with split landing gear, 16/4 wheels and tires, cowling, instrument board, motor mount, tail group and controls, all assembled and covered, $175. Heath Henderson engine, $150. Clarence McGarvey, Pyote, Texas.

FOR SALE

FOR SALE—Miscellaneous Accessories: Wooden J5 props and hubs, instruments of all kinds, magneto switches, engine driven fuel pumps, landing lights, navigation lights. Many other items of all kinds. What do you require? Write Bellanca Aircraft Corp., New Castle, Delaware.

For the home builder: Wings, tails, fuselages, Henderson engine; cheap. Address J. Wallace, 130 Valley Road, Montclair, New Jersey.

FOR SALE: Henderson propellers, copper tipped hardwood, new, $15. With spinner and cap, $20. Material for spinner cap complete, $2.50. Rib gussits plywood 1x1¼, 30c per 100. Fitting material, 15c per lb. H. W. Johnson, Box 223, Kennedy, New York.

AIRPLANE PHOTOGRAPHS: All makes; brilliant 7x10 heavyweight, 3 for $1 C.O.D. Boeing, Curtiss, Lockheed, Travel Air, Waco, Falcon, Gee Bee, Corsair, Douglas, Ford, Stearman, Bellanca, Keystone, Martin, Sikorsky, Patrician, Great Lakes etc. Write for special offer. John Stiles, Stoughton, Mass.

NEW low prices on Hisso parts for all models. Also have Wright J4, J5, H2, H3, Anzani, Liberty and Kinner parts cheap. Write for list today. Karl Ort, York, Penna.

HEATH PARASOL: Stop wishing you could fly. Now fly in all weather. America's most popular sport plane—winner of light plane event at 5 consecutive National Air Races. Build it for $199. Parts may be purchased in 11 convenient progressive groups; $12 brings first shipment. Heath plans and detailed explanation sheets so complete even the unskilled can follow. Ten cents in stamps or coin brings large illustrated booklet. Heath Aircraft Corporation, Dept. CL, 25-A, Chicago.

HEATH PROPELLERS: Give immeasurably finer performance because they are designed by skilled engineers to fit each individual job. Cost no more than ordinary stock propellers, yet are guaranteed to give added propulsion to sleds, boats and airplanes. Four cents in stamps or coin brings complete propeller catalog. Heath Aircraft Corporation, Dept. CL 24-A, Chicago.

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WANTED: Experienced performer for August, September and October, 1931; make county fairs. Write me. Box 7, Currie, Nevada.

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PARACHUTES: Approved type. Seat, back, lap and chest, bought, sold, exchanged, repaired. Tell all first letter. Professional parachute jumpers and balloonist furnished for all occasions. Thompson Bros. Balloon & Parachute Co., Aurora, Illinois. Established 1903.

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WANTED

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WANTED: Lincoln Page wings, repairable condition; Landing gear OX5 propeller. Weldon Williams, 1300 Penn Ave., Pittsburgh, Penna.

WANTED: One center section, one right lower and upper wing for model 2000 Travel Air, year 28. Write prices to W. E. Mobly, 307 Duncanville Ave., Dallas, Texas.

WANTED: Two or three place plane; may be uncovered, covered, damaged slightly, with or without a motor. State price, make and condition of ship. AERO DIGEST, Box 1064.

WANTED FOR CASH, good Miller valve action. Write AERO DIGEST, Box 1068.

WANTED: Will pay cash for a bargain in a two or three place plane. Must be licensed and in first class condition with air cooled motor. Prefer Aeromarine Klemm, but will consider other reputable make. Give all details and state lowest price in first letter. A. H. Swett, Jr., 39 S. Willow St., Montclair, New Jersey.

WANTED: Heath plane in good flying condition. Send full particulars and lowest price. W. Highland, 26 North Park Avenue, Rockville Center, Long Island, N. Y.

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WANTED: TRAINING PLANE. Gipsy Moth biplane or similar ship. Dual control. Must be in good condition and airport near New York. State particulars and lowest price. AERO DIGEST, Box 1077.

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WANTED: Will trade fast Caille class B outboard and new twelve foot mahogany step plane for Heath Parasol with or without motor. James H. Hamlen, Brooks School, No. Andover, Mass.

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700 Rooms 700 Baths

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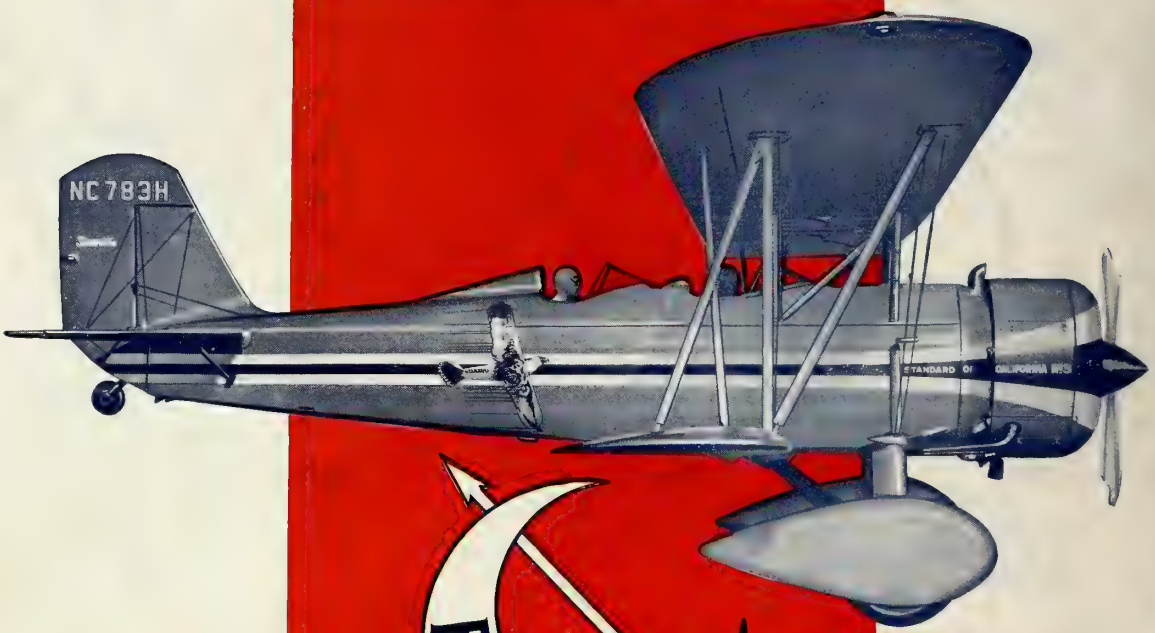
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March 1931 ★ 35 CENTS

AERO DIGEST



FIVE YEARS OF NAVAL AVIATION

★★ by Rear-Admiral Moffett ★★

AERIAL INVASION • LIGHT AIRPLANES

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The Air Transport Map
as a chart of
Pratt & Whitney Progress



The Boeing 40-B-4 for passengers and mail is powered with a Pratt & Whitney "Hornet"

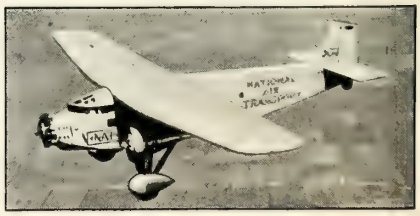


Two Pratt & Whitney "Hornet" engines are used on the Consolidated Commodore

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*ONE OF A SERIES OF ADVERTISEMENTS BASED ON STATEMENTS



Above: Miami, Fla.—The Autogiro was the center of interest at the recent All-American Air Races and Navy Field Dedication



Above: Taking off from Bay Front Park, in the heart of Miami's hotel section. A striking illustration of the Autogiro's small area maneuverability.

Below: James G. Ray, veteran mail and test pilot, goes voyaging.



Below: Homeward bound from Miami to Pitcairn Field, Philadelphia. The trip included demonstration stops at several southern cities.



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BY RECOGNIZED AVIATION AUTHORITIES—NAMES ON REQUEST

"turn out something to fit the private owner-flyer"*

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Large scale development of private ownership depends, however, upon the removal of limitations inherent in the conventional airplane of today.

There must be less dependence upon piloting skill, and consequent reduction of training time and cost.

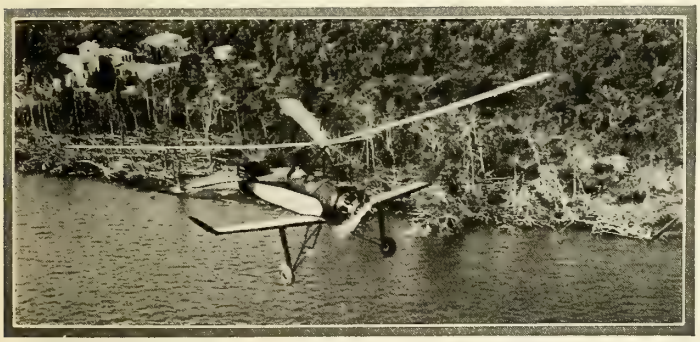
It must be possible to take off and land at very low speed, and to slow down or even stop in the air at will.

It must be possible to land almost anywhere in case of necessity.

By reduction of the area necessary for take-off and landing, it must be made possible for the moderate-sized suburban or country home to have its private field, and for public fields to be located closer to residential and business centers.

The Autogiro has demonstrated that it can be the means of meeting each of these requirements. It offers to aircraft manufacturers the most inviting opportunity in aviation history. We are prepared to acquaint the industry with Autogiro principle, design and construction—to arrange demonstrations and discuss production privileges.

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The inherent characteristics of the Autogiro permit it to fly low and slow, as well as high, fast and far.

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The Autogiro differs basically from all other heavier-than-air craft in the source of its lifting capacity. This lift is given primarily by four rotating blades which take the place of the familiar wings of an airplane. There is no time when this supporting rotation of the blades can be stopped while the machine is in the air, as their motion is produced solely by wind pressure caused by the movement of the Autogiro in any direction, climbing, level flight, gliding or descending vertically. The supporting rotation of the blades is entirely independent of the engine, whose sole function is to propel the Autogiro.

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AUTOGIRO

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a plane you can *afford*—
a plane you can *fly*—
a plane you'll be *proud to own*—

The HEATH PARASOL—$975 *complete*

(Special equipment *free* for limited time only)



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Stop thinking your flying career is ended—just because of limited funds. Now fly all the hours you want with a Heath Parasol (Champion for 5 consecutive years at the National Air Races)—and fly them with big plane safety and performance at the lowest cost in aviation history

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Consider, too, its unparalleled low flying cost. It flies 40 miles on a gallon of gas. It requires no airport or hangar—as it lands on any field or even a highway—and with wings mounted on its sides, it takes no more storage space than a car. And consider its amazingly low flying cost—actually less than 1 cent a mile! Then you'll understand its title—America's most popular sport plane.

Almost flies itself!

Just picture yourself flying this beautifully designed little plane at a top speed of 85 miles per hour. Over a 400 mile cruising radius. Safely bearing as great as a 300 pound load. With a visibility so remarkably complete you can see above and below—and even dead ahead under you. And with a design so inherently stable that experienced fliers actually land it with hands off the controls!

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once were doubtful—now read what they say—

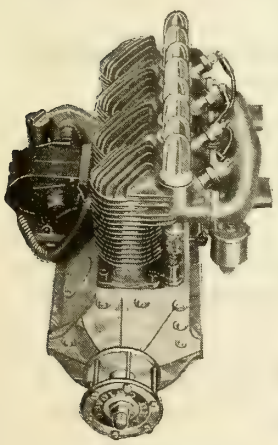
"—my Parasol outperforms any ship flying out of our airport —4900 feet above sea level."
"—anyone who has ever soloed can fly a Parasol with complete safety."
"—the ship handles well. I took it to 3000 feet in my first flight and find it great for building hours."
"—the Parasol has twice the beauty, workmanship and ability that I expected."
"—the Heath Parasol is the finest sport plane and the most practical ship I've ever seen for twice the money."

(excerpts taken from letters on file at Heath factory in Chicago.)

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Now for a limited time—such important accessories as motor starter, balloon tires, brakes, and metal propeller are being given with each Heath Parasol, WITHOUT EXTRA CHARGE. Buy your plane now and get this equipment free. It will add immeasurably to your enjoyment of the plane.

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The new Heath B 4 Engine, first place winner at the 1930 National Air Races, is exclusively an aircraft motor—and is standard equipment with all Heath flyaway planes.



A few Heath Parasols lined up at the Heath Airport, Chicago. Hundreds of these remarkable little planes are in use today—some in such distant countries as India and Peru!



Seaplane floats can be quickly substituted for the regular landing gear. This actual photograph shows that the Sea-Plane Parasol loses none of the stability for which the land plane is famous.

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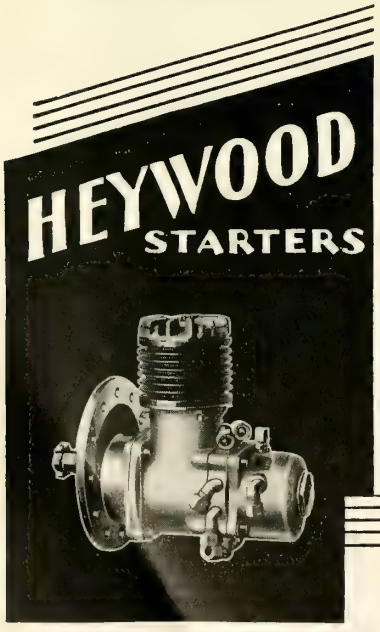
In the field of engine design and manufacture "Continental" is indeed a recognized standard. For years "Continental" and "Motors" have been synonymous in the minds of millions.

And with that intolerance of mediocrity which distinguishes a leader, Continental selects a Heywood Starter for their own field and service plane shown above.

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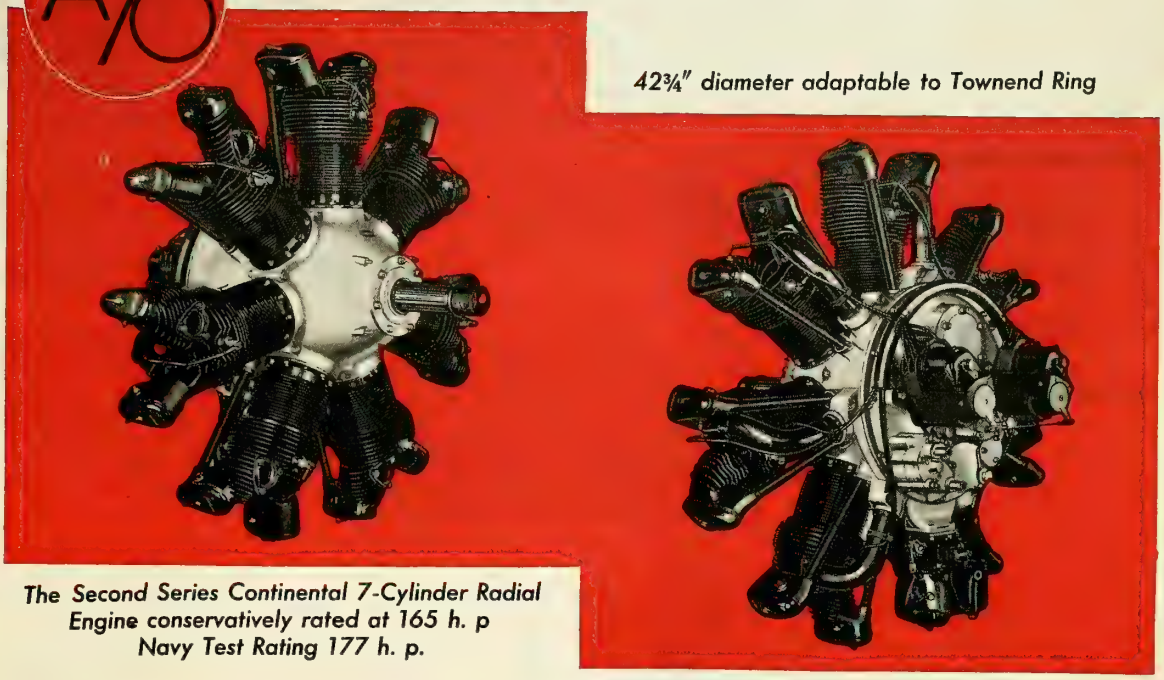
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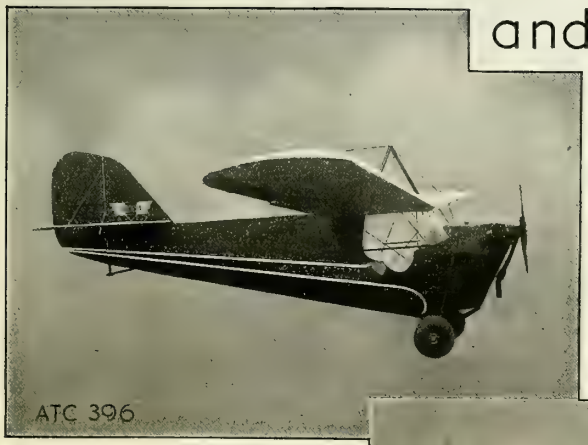


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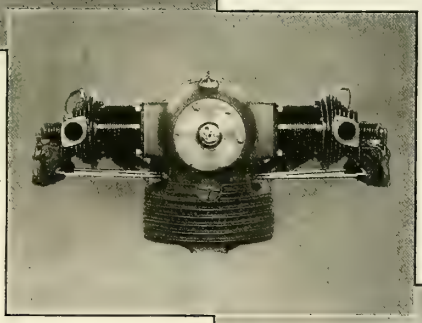


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Now, while others are vainly striving to duplicate Aeronca performance, and to approach our 1930 standards, we are enhancing our acknowledged leadership by producing 1931 Aeroncas that actually *surpass* those standards.

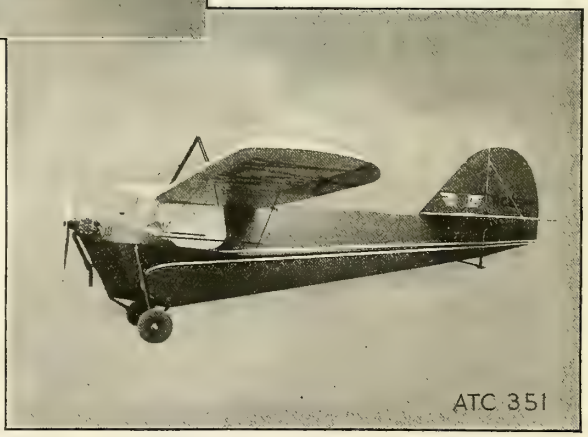
AERONCA DELUXE C-2 . . . Without altering areas or aerodynamic design of the original Aeronca C-2, we have added greatly to its appearance, comfort and convenience. Wide strut-type landing gear; improved semi-cabin type windshield; wider fuselage for accessibility; improved upholstering of seats and back rests; enclosed baggage compartment; all combine to make the DeLuxe C-2 as superior in appearance and comfort as in performance.



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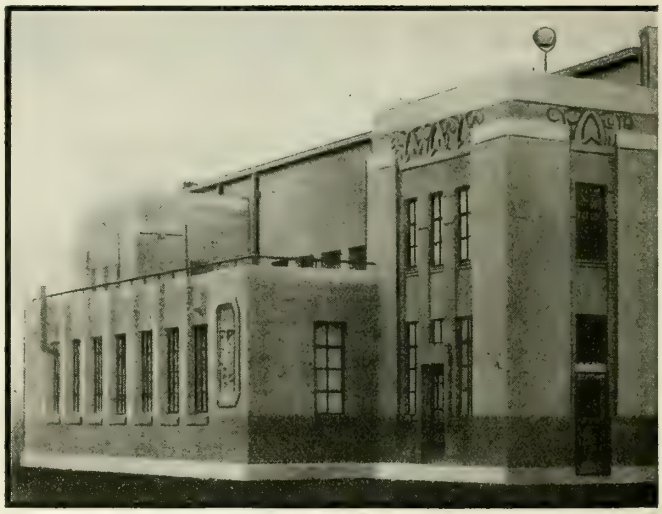
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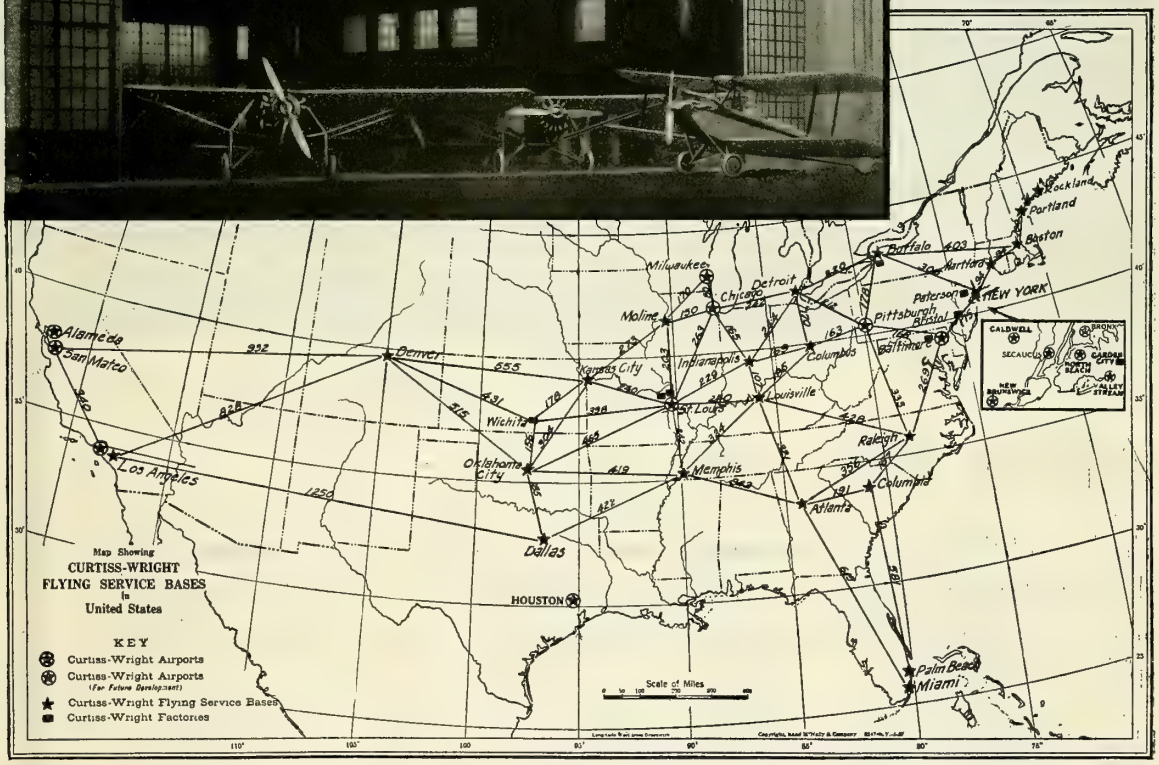
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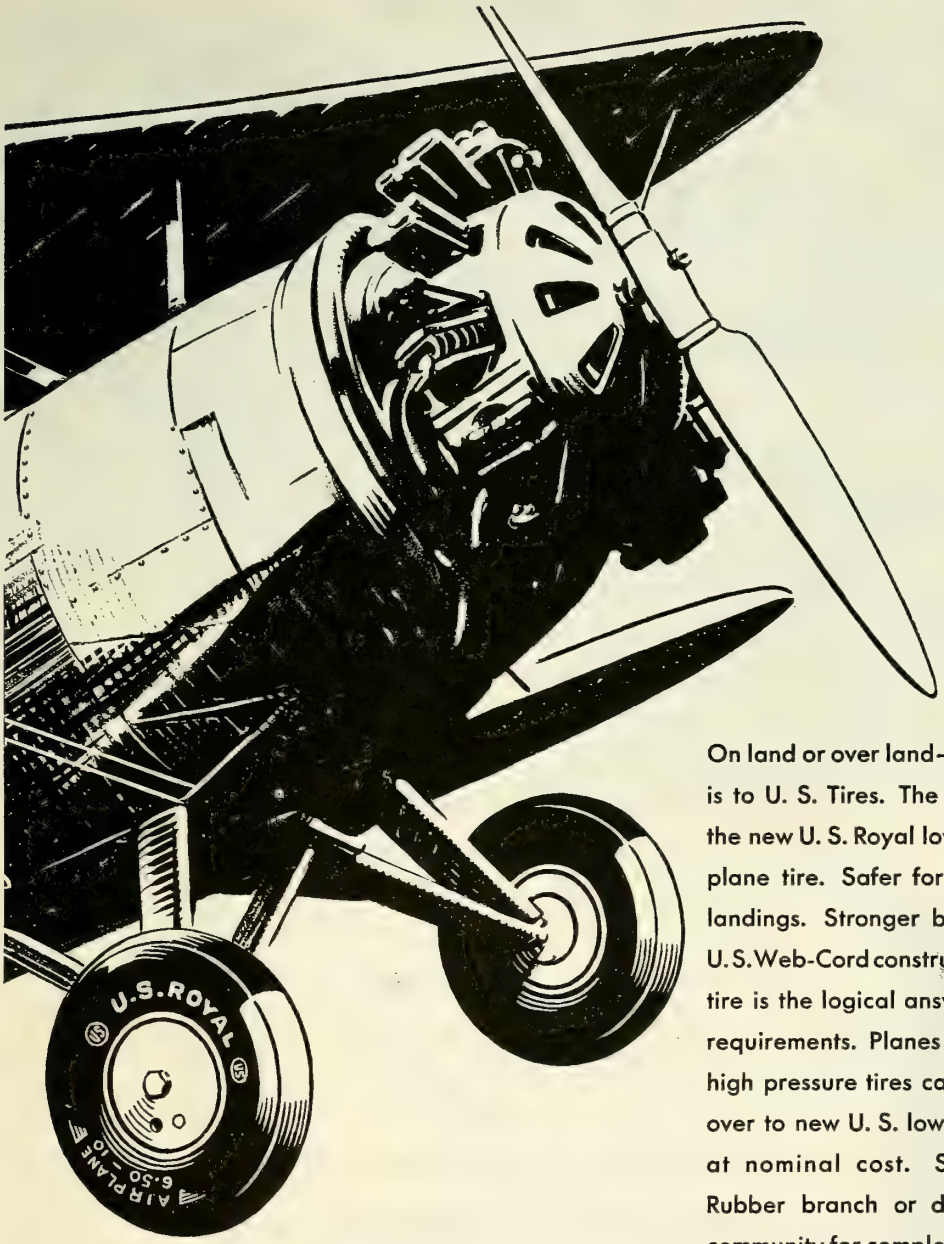
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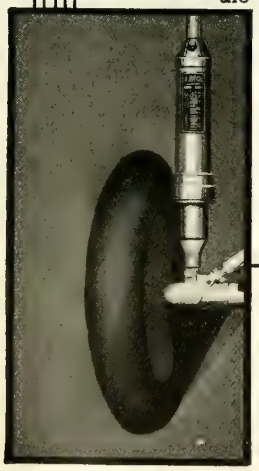
You are to be congratulated on your product and the results it brings to the ones who use it.

Very truly yours,

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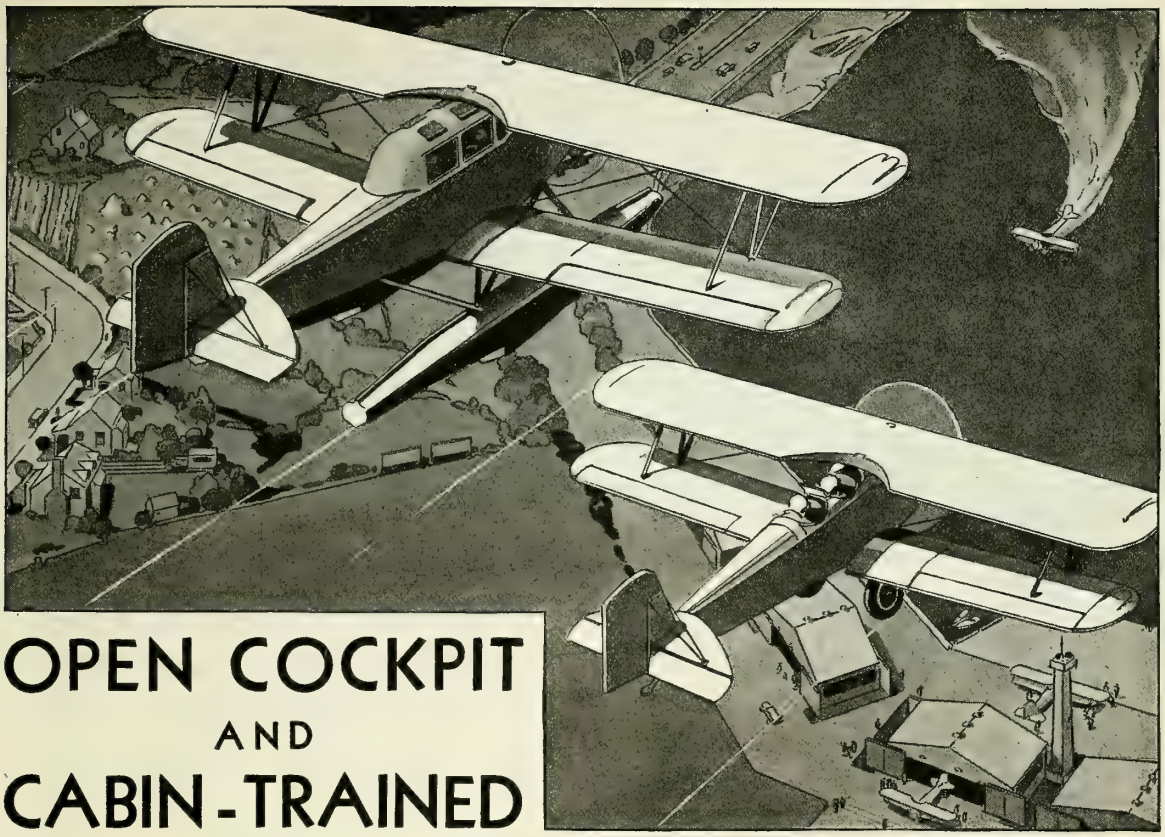
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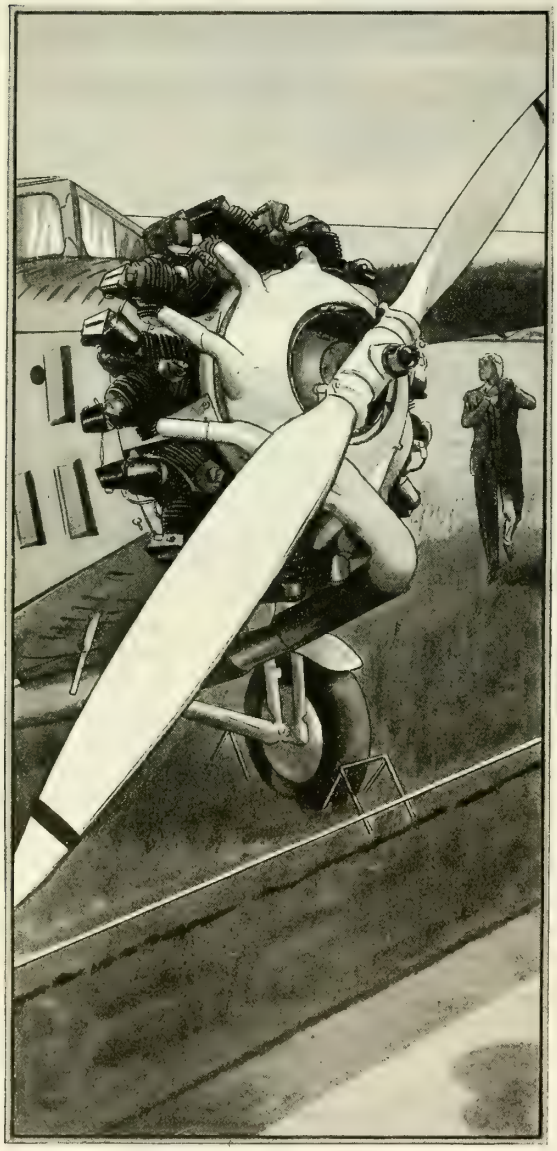
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"After using Kendall Oil exclusively for the last three years in our WACO planes, we believe thanks is due the Kendall Refining Company for its quality service. In connection with our sales work, we operate one of the most up-to-date and complete aviation schools of its kind in the country, and Kendall Oil is used.

"Owing to our prominence in sales and service distribution of the popular WACO plane, we have had the privilege of a great many gratis tests of different makes of oil. These tests have been made both in winter and in summer, and it is with great pleasure that we state we would rather buy Kendall than use most of the other oils, no charge. Our reason for making this statement is because your cold test in winter on Aviation Oil has not been equalled, and under hard flying conditions or the heat of summer the oil pressure remains standard.

"A pilot must be sold on the oil he uses, and the great strides that the Kendall organization has made in the past two years establishing outlets on practically all airports is testimony in itself that your product meets with public favor. We most sincerely recommend its use to all purchasers of WACO planes."



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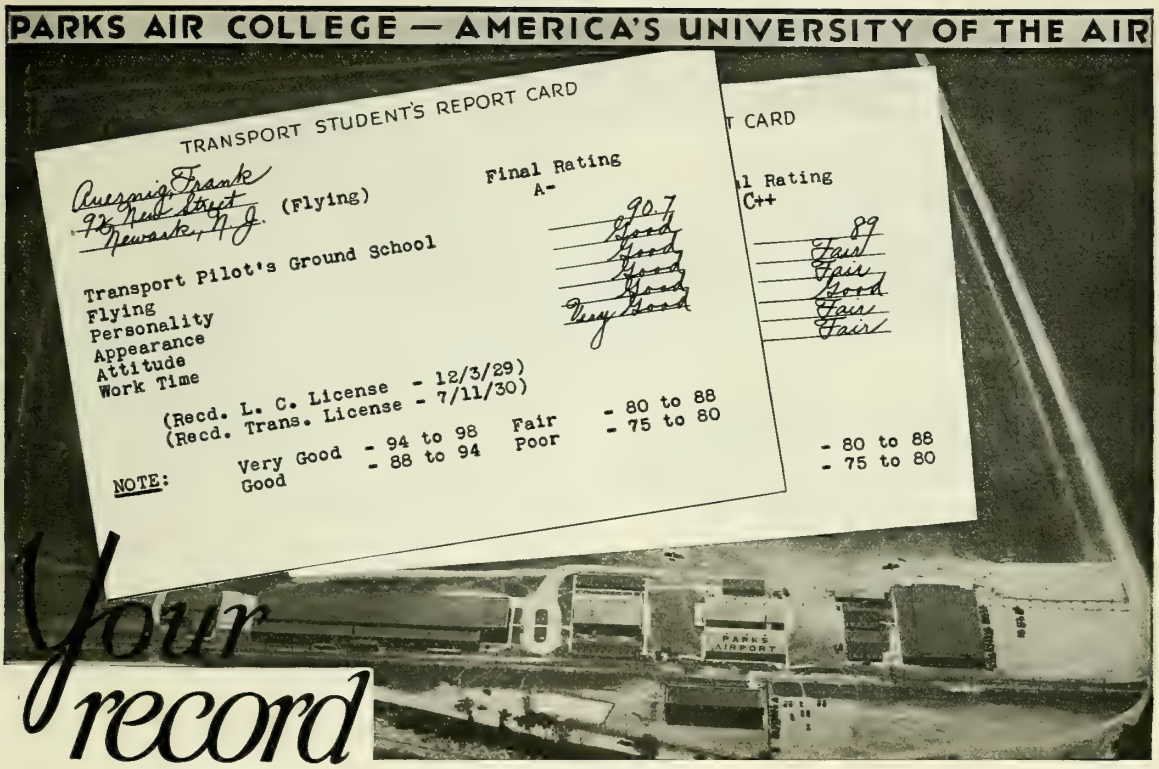
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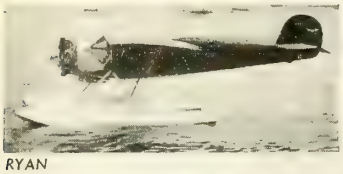
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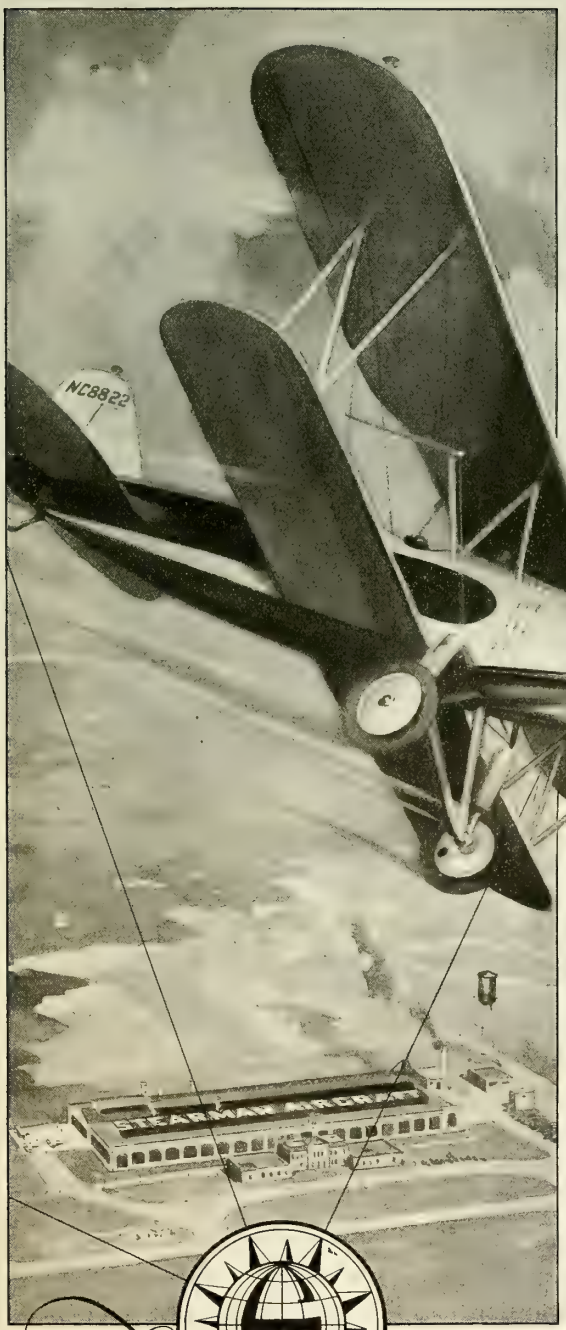

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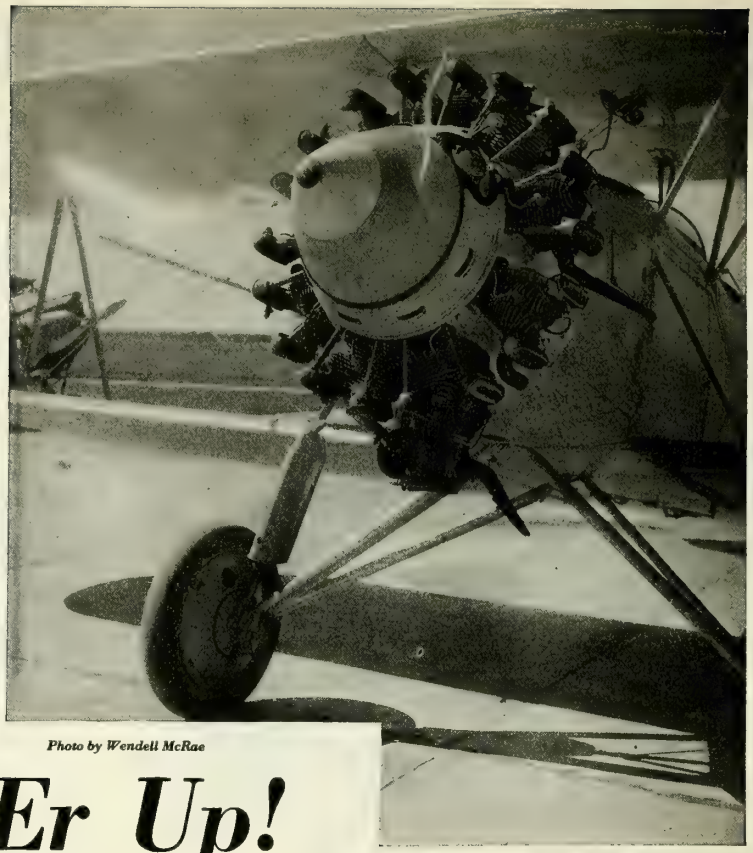


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It is significant that the great flight of a squadron of Italian planes across the South Atlantic received relatively slight attention. The world has grown accustomed to long flight and is getting rapidly away from pioneering days, except in countries that are also backward in other forms of transportation. Seasoned travelers are becoming accustomed to airplane service. Double sections are flown between Chicago and New York in six and a quarter hours! Gardenias are sold in wintry New York thirty-six hours after leaving sunny California!

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A new transcontinental air-express has recently been opened, which will carry packages up to 200 pounds weight from coast to coast in 36 hours. In addition to this, there are several services which connect with the great air-express services of Europe. It is literally possible today for the people of Cairo and Bagdad to see moving-picture releases as promptly as on continental America—*within two weeks after air-shipment from Hollywood!*

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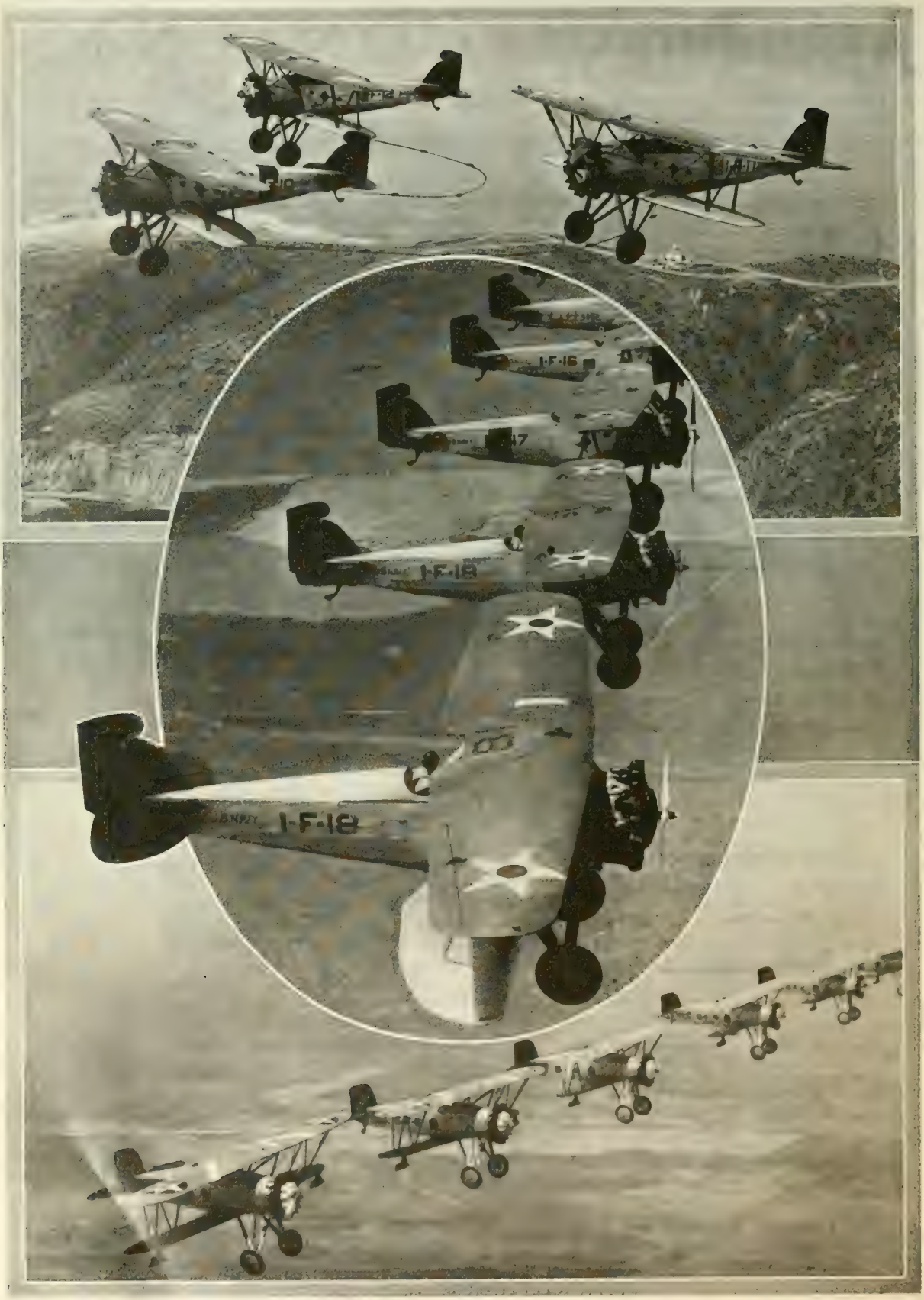
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The Navy's fighting air squadrons maneuvering with characteristic coördination

FIVE PROGRESSIVE YEARS IN NAVAL AVIATION

Rear-Admiral W. A. Moffett

Chief, Bureau of Aeronautics, Navy Dept.



DURING the past five years both the material supplied naval aviation and the conception as to possible employment of this material in conjunction with other combatant arms of the United States Fleet progressed to a remarkable degree.

Five years ago we had, in effect, comparatively little aviation with the Fleet. The *Langley* had been converted to an aircraft carrier prior to that time, it is true, but had been used exclusively for experimental work. The catapult had reached a fair stage of perfection, but had not yet been installed in sufficient numbers to enable adequate observation or spotting planes to accompany the Fleet.

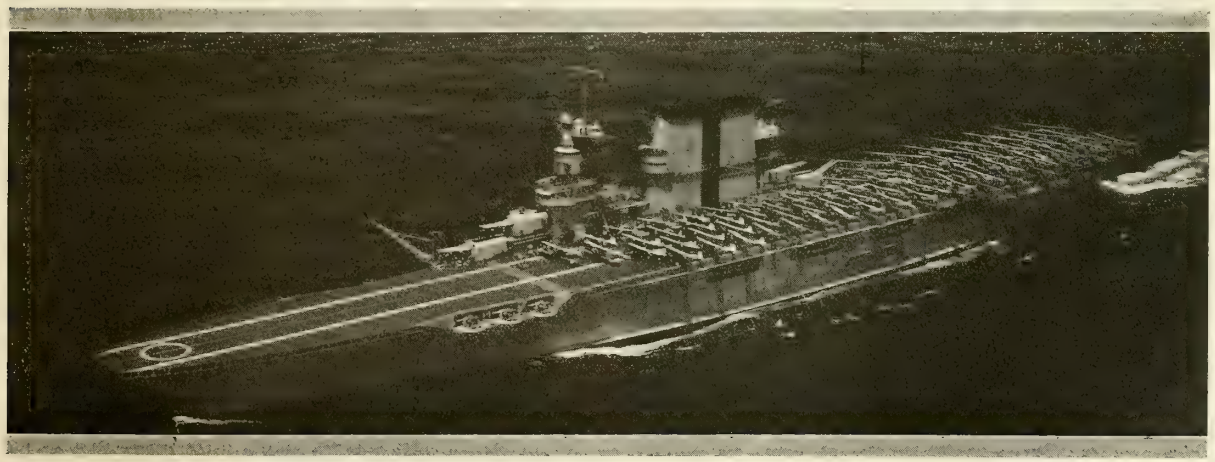
Today, every battleship and cruiser of the Fleet carries airplanes as a part of its regular equipment, and we have two great carriers in the Fleet each with eighty planes to take the air at a moment's notice. Aviation goes to sea with the Fleet, and the airplane now is as integral a part of the armament of the Fleet as are its guns, torpedoes and the like.

The years 1925-1930 also witnessed amazing progress in the development of the airplane itself as a weapon of the Fleet. From low-powered aircraft with limited load factors and performance, a steady progression has been made to the powerful heavily-armed fighting units that are at present launched from catapults or from the decks of carriers.

As an example, five years ago the fighting plane made a high speed of 122 miles an hour and had a ceiling of 13,500 feet; today one of the fighting class has a high speed of 175 miles an hour and has a service ceiling of more than 27,000 feet. Similar progress has been made in all the various types which go to make up our naval air forces.

Another type of plane which illustrates the Navy's progress with its wings is the flying boat. During the World War the big need of naval aviation was aircraft for counter-submarine work and for convoy and patrol duty to be operated from shore bases. This led to the development of large flying boats, and at the end of the war this type of plane existed in a fairly satisfactory state of perfection. Although since then the Navy has concentrated its main attention to the development of aircraft suitable for use with the Fleet, it has not neglected the further development of the large flying boat for purposes of coastal defense and to patrol and protect our sea lanes of commerce and our lines of communication to the Fleet.

The guarding and patrolling of sea areas both near and far is essential in order that vessels of all kinds—food ships, ships carrying sorely-needed war supplies—may have assurance of safe passage protected by the air eyes of these large flying boats from enemy mines, submarines and fast raiders. Because the distances to be covered are great, the endurance of this type of plane is of prime



The aircraft carrier U.S.S. "Saratoga" under way with a full complement of naval airplanes on her flying deck

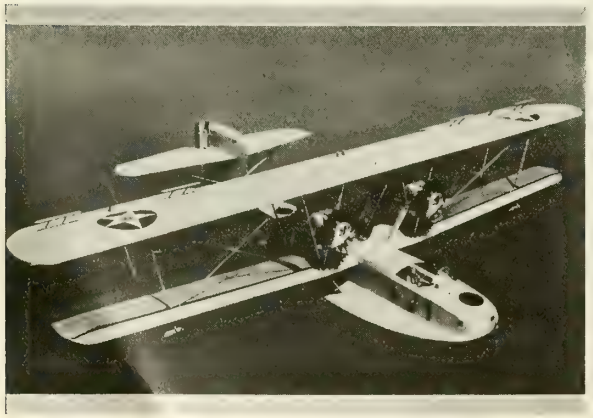


Catapulting a Vought 02U seaplane from a ship

importance. The personnel manning these flying boats must be well versed in basic naval tactics, communication, navigation over the water and recognition of types of surface craft. Manifestly, knowledge of this kind requires a thorough naval education which it is the object of constant naval training to obtain.

A series of large flying boats known as the PN series has been constructed by the Navy, the original PN airplane being a modification of the standard F5L Navy patrol boat of the war. The latest type of Navy patrol boat is powered with four engines of 600 horsepower each, has a gross weight of 33,271 pounds, with a useful load of 17,764 pounds and has a cruising radius of 1,980 miles. Flying boats of such immense size are incapable of being handled on board ship and hence must of necessity be operated from coastal air stations.

One of the most interesting transitions which have taken place recently in the development of naval aircraft has been the elimination of wood and the introduction of metal in their construction. It has been realized for years that wood for structural parts of aircraft is in a measure unreliable. The unknown qualities which affect its strength are always present. Wooden members used in seaplane construction gain weight by absorbing moisture and suitable woods have been more and more difficult to obtain. Hence there has been a definite movement toward metal construction of naval aircraft. The trend was first to steel then to a combination of steel and duralumin and the present progress is to use light aluminum alloys entirely. These insure more dependable, lighter and stronger structures.



PN-12 navy patrol flying boat in flight

The passing of the wooden propeller with its inherent defects of susceptibility to climatic conditions, of erosion due to the elements and of its non-variable blade setting has also taken place during this period. The metal propeller with its adjustable blade feature and its advantages of durability and safety has come into use as standard equipment of naval air units.

One of the outstanding features of the recent progress in naval aviation has been the perfection of the air-cooled engine in practically all power ranges. From a modest beginning of one satisfactory air-cooled powerplant developing approximately 200 horsepower, there are now in production and in service proved units covering the complete range from 150 horsepower to 600 horsepower. Although not losing touch with water-cooled powerplant development, the Navy, in the interest of lighter and smaller planes for compact storage aboard ship, has been forced to the adoption of the air-cooled engine as standard. It has vigorously sponsored the development of this type and the soundness of the Navy's policy in this regard is borne out by the almost universal adoption of air-cooled engines for commercial planes and the interesting application of military types in other organizations.

The steady development in instruments for naval aircraft has been made along lines of standardization, reduction in size, weight and methods of test. Notable improvements have been made in equipment for "blind flying" and navigation. This development has undoubtedly been of great assistance in the successful culmination of many of the outstanding flights of recent years.



A CS torpedo seaplane launching its missile

The research work in the Navy's wind tunnel and model basin at the Washington Navy Yard and its research laboratory at Bellevue has yielded valuable returns by way of improvement in the water characteristics of both hulls and floats, improved wing sections and reduction of parasite drag, and has generally enlarged the fund of scientific knowledge in aerodynamics.

The Navy increased its research facilities a few years ago by the establishment of an aeronautical engine laboratory at the Philadelphia Navy Yard and a flight test section at the Anacostia Air Station. These research units permit the Navy to conduct performance tests on all kinds of planes, engines and equipment and to gain first-hand information as to their characteristics. The rapid progress in the art of flying within the past few years has placed a tremendous load on all these research activities, for new ideas are presented for testing and investigating in much greater numbers than heretofore.

The operation of catapults for the launching of planes from ships has been changed during the past five years from one requiring the most careful supervision of highly trained personnel to an everyday routine procedure aboard all the battleships and cruisers of the Fleet. There has been a steady increase in the capacity, reliability and sim-

plicity of catapult operations and further development of this air apparatus is going ahead at a rapid pace.

Five years ago the Navy, after its acquisition of the *Los Angeles,* had two rigid airships—the only two airships then operated in the world. In 1925 the unfortunate disaster to the *Shenandoah* shook public confidence in airships as a means of transportation and caused within the Navy Department a reconsideration of the whole lighter-than-air idea of aeronautics. It was determined to continue the development of this branch because of its potential value to the Navy and also with a view to its promising use in the field of commercial aviation. As a result two rigid airships, which when completed will be the largest in the world, have been authorized by Congress and have been contracted for. The first of these is scheduled for completion in June, 1931.

Important development and training work has been carried on utilizing the *Los Angeles* and two smaller non-rigid airships. Extensive full flight research has shed light on airship problems that were hitherto somewhat obscure. Water recovery apparatus, an important adjunct to helium filled airships, has been improved. Materials entering into the construction of airships have been developed and perfected. Handling methods have been tried out and the present mobile mooring mast evolved which permits a large reduction of the man-power formerly required to handle airships. Production of helium has been encouraged, and from a point five years ago when there was not



The "Los Angeles" moored to mast of the U.S.S. "Patoka"

sufficient helium for the two 2,000,000-cubic-foot airships, a reserve is being built up and no difficulty is foreseen in having ample supplies of this gas to take care of the two new 6,500,000-cubic-foot airships now under construction. The development of a satisfactory oil burning engine for airships has been undertaken and there is good promise in the near future that a suitable engine of this type will be available. Preliminary steps have been taken looking towards the establishment of an additional airship base in the West Coast area. Such a base will be a necessity before the second of the two airships now under construction is completed.

In 1925 naval aviation faced the problem of supplying a sufficient number of naval pilots, both officers and enlisted men, to meet the demands of expansion and increased activity which were far in excess of the proportion of qualified personnel available at that time or that could reasonably be expected in the immediate future. Every effort was made to increase the familiarity of all officers and men with the aims and requirements of naval aviation and to encourage them for service therein.

In June, 1925, aviation instruction for midshipmen was added to the curriculum of the Naval Academy, so that beginning with June, 1926, every class graduating from that institution started out to the service trained in the rudiments of aviation.



XPY-1 flying boat used for patrol missions

During the same year, in order to meet the demands of the service for an increase in the number of naval aviators caused by the enactment of the five-year building program, more frequent classes for officers were commenced at Pensacola. The plan now in effect is to send fifty students each month for training.

In 1927 further steps in the familiarizing of officers of the Navy with aviation was made by instituting indoctrinal courses at Hampton Roads and San Diego which ensigns attend during the first year of their service. In January, 1929, similar indoctrinal courses were made available and required for enlisted men volunteering for flight training.

Five years ago there were on duty 382 naval aviators and 3,308 enlisted men, of which 1,711 held aviation ratings. Today the Navy has 614 qualified naval aviators, 244 enlisted pilots, 2,895 enlisted men holding aviation ratings and 7,874 on aviation duty. Although the number of aviators is still below that required, the increase during the past five years shows substantial progress.

While the problem of training and supplying aviation personnel was being worked out, much attention was given to naval Reserve aviation. The popularity which the art of flying has gained in the last three years has resulted in the receipt of hundreds of applications from civilians for naval aviation training. Ten Reserve squadrons have been assigned personnel on permanent active duty and material for the actual carrying on of flying activities. Ground school courses have been established in a number of universities throughout the country. Elementary flight train-

(*Continued on page* 124)



Vought Corsair amphibion coming up a runway

THE TRAFFIC OF TOMORROW

By Don Rose

ONE of the younger members of the audience writes to inquire what I think of aeronautical engineering as a profitable profession for the year 1938.

I perfectly appreciate the compliment, whether it was intended as such or not. And I suppose that the gentleman is looking ahead to the end of an academic and technical education, when he would like to cash in considerably on his efforts to amount to something. Knowing me not at all, he seems to suppose that second sight and the spirit of prophecy are among my natural attributes. He trusts me to tell him what his skill and studies will be worth seven years from now, in a world that hasn't been assembled yet.

My dear sir, says I, you flatter me but you don't tempt me. I won't tell you. I won't tell you for a number of reasons, and particularly because I don't know. I don't even know what will happen in the middle of next week, and if I did I might not be willing to wait around for it. I don't know if it will rain tomorrow, though I think it likely, since I left my umbrella and galoshes down town at the office. I don't know whether my job will be tomorrow where I left it today, nor whether the morning mail will be worth the trouble of opening it. I don't know anything about tomorrow, which saves me a lot of anxiety, apprehension and expectation.

I make the point to my young correspondent that his problem is much more difficult to determine than the Democratic candidate for 1932, which is a matter causing headaches and heartaches in all the wide open spaces where Presidential possibilities are rated at a dollar a dozen in the off years. It is more of a riddle than the rise or fall of tomorrow's stock market, which is something on which I can't find courage to bet a plugged nickel. It is a difficult and unanswerable question, not merely because 1938 is a long way off, but because the earning capacity of an aeronautical engineer is a complicated problem in economic equations, with most of the quantities unknown and no certainty that two and two can be trusted to make four.

Apparently I have been misleading my public again. I have been pontificating like a prophet and speculating like a soothsayer. I have been reading signs and portents into the oracles, including the cryptic utterances of Congressmen and military experts. Somebody has taken me too seriously, so I shall do so no more. I shall never say another word as to which way the cat will jump. Well,—hardly ever.

But I am aware that in retiring thus from the prophetic profession I am going to miss a lot of good clean fun. I fear I shall also be left rather lonely among my fellow journalists, most of whom are experts at counting the chickens before they are hatched. Particularly are they fond of forecasting the destinies of aviation, with or without pictures, and imagining what the world will be like when babies are born with wings and ailerons. And what a mess they make of it!

Ever since man first looked wistfully at a bird and wondered how the trick was done, there have been those who were willing to speculate a century or so ahead to the time when men would fly. The ancients did their best with stories of flying carpets, winged horses, and bottle imps who whisked their masters where they wanted to go at a speed which would make Frank Hawks nervous. They had the idea of flying, though they were a little short of machinery. They thought that men should fly, though they didn't know exactly how they should do it.

But long centuries later machinery was made, and thereupon the romancers began to dream again. The fiction writers "invented" flying machines of all sorts and sizes—flying boats and multi-motored helicopters and other useful means of conveyance and communication. Jules Verne, for instance, put big ideas in the heads of all the youngsters of his time with a flying machine that would do everything but the week's wash. It went up and down like an elevator, it flew around the earth at hundreds of miles an hour, and it stayed up in the air for weeks at a time. The only thing wrong with it, indeed, was that it had no more aerodynamics in it than a ground hog. But since nobody knew much about aerodynamics at the time, nobody cared very considerably.

So long as nothing whatever was certain about flying, everything and anything seemed possible. But you would suppose that by the time aeronautics had become a matter of science and experience, the prophets would begin to pull their punches. They would not jump too far into the future without a parachute of common sense. They wouldn't expect the unreasonable or prophesy the impossible. They would stop writing romances about the future of aviation which have no respect for its present.

They didn't. There have been more wild-eyed journalists wading knee-deep in absurdities about aviation's future since the beginning of the present century than there were when nobody knew anything about flying except that it was a swell idea. There is more fantastic tripe tied to this topic than was needed to invent all the fairy tales of the ancient world. There is more romantic nonsense written about aviation today than there was when nobody knew anything about it.

It wouldn't matter much, except that it has turned out to be bad for business and a little discouraging to those who want their neighbors to be air-minded but not light-headed. It has been bad for business, because it has been part of a mood of great expectations, unsupported by solid sense and experience, which led so many of the brethren to lose their shirts in the dear dead days of two or three years ago. It is discouraging, because aviation is bound to build intelligently and carefully for the future, or it may not have any. There is harm in it, because the dear public may be fond of romances but it doesn't pay cash fares for riding in them. This business won't be what it should be until the traveling public regards the airplane realistically as a transportation convenience and not as something with which to fill the Sunday supplements.

It is legitimate to analyze the trend of the times and the likelihoods of progress, so long as you don't try to sell shares in them to the innocent bystanders. It is not legitimate to upset the public imagination with a lot of things that are not in the least likely to happen. It is particularly

(*Continued on page* 120)

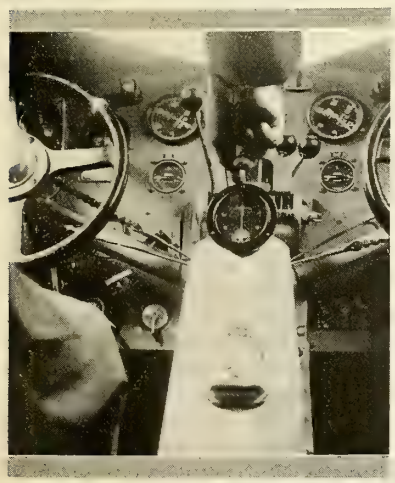
A NEW HOMING DEVICE FOR BLIND FLYING

By G. G. Kruesi

THE difficulties with which air transport companies are confronted, particularly with reference to safety during regularly maintained scheduled trips, constitute an enormous problem indeed. Safety and the regular maintenance of schedules form two factors which have a decided influence upon the growth of this new system of transportation.

In order to assure safety, the transport companies follow the conservative but wise policy of cancelling flights when the weather is bad for flying. Acquiring knowledge of weather conditions at the ports and along the flying route, as well as the transmission of such information to pilots while in flight, has been the subject of elaborate, time-consuming experimentation. Most of the past difficulties in this respect are overcome today—radio has adapted itself in a very convenient manner. By means of radio telephone equipment installed at the various ports and on the planes, pilots are regularly informed of changes in weather which may take place while they are in flight. They know at all times not only the weather conditions existing at the point of destination, but also the conditions existing at intermediate points along their route.

In spite of the satisfactory service which radiophone equipment renders, it frequently occurs that in the interest of the safety of passengers schedules must be cancelled, or if the ship is already under way, it must be directed to the nearest field on which it is possible to land safely. This is costly, however, and constitutes one of several factors tending to retard progress in air transportation.



When the indicator points straight up, the plane is flying on line with radio station

Numerous methods have been suggested to overcome these difficulties, but unfortunately the development of these devices is only at its beginning. A few of these proposed remedies are fundamentally sound in their nature and will eventually assure complete success once they are properly developed. In order to maintain regular schedules it is necessary for the pilot to be able, during conditions of little or no visibility, to—

(1) fly safely out of a field;

(2) pursue a given course;

(3) be informed when the plane has reached its exact destination; and then, finally,

(4) land the plane safely even though flying blind.

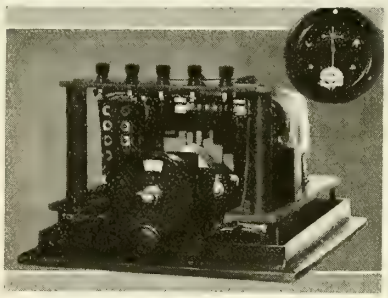
This in turn requires four essential mechanisms to perform these functions. It is believed that they eventually will consist of—

(1) An automatic pilot consisting of gyros connected to the controls of the plane in order to assure lateral stability when taking off and flying blind;

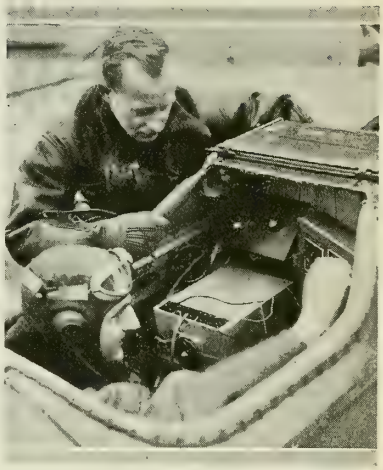
(2) Radio equipment outlining the course which is to be flown, such as the present type radio ranges;

(3) Homing devices which will enable the pilot to locate with ease the nearest landing field in case of an emergency;

(4) A landing device which will enable the pilot to descend through fog into the field with reasonable safety.



The radio receiver is about the size of a cigar box and weighs ten pounds



The author (in cockpit) explains how the new homing device indicates direction

It has been an interesting experience for me to concentrate on landing devices and to a lesser extent on homing devices for several years before actually becoming associated with the operation department of an air transport company. Although prior to making such contact ideas developed were of a rather experimental character but showed promising results, I was at a loss to incorporate those ideas to advantage so far as their actual use within the operating department of an air transport company is concerned.

Laboratory engineering practice can only be used efficiently in this new field if one is thoroughly acquainted with all the details of operation of an airline. Without the daily contact with pilots, airplane mechanics and the ever arising new problems met in radio installation work on planes, one would hardly have been able to develop a radio homing device such as is described here.

Navigational instruments must be accurate and reliable at all times. Pilots will naturally regard any newly developed navigational instrument with a skepticism for which he is certainly not to be blamed.

This new homing device therefore has been developed with the following points in mind: (*Continued on page* 140)

AERIAL INVASION OF THE UNITED STATES

by Caldwell

WHILE any informed American citizens, viewing the political and military situation in Europe and Asia, will agree that in those continents the embers of war always are smouldering, ready to spring into a blaze at the first gust of windy, nationalistic ill-feeling, what he will not agree to, what he will not even believe, is that such a war conflagration could spread to this country and take the form of an actual invasion of our land.

It is not my purpose, nor within the scope of this survey to point out the source from which these invasions may come. It should be sufficient to point to the present military, naval and air establishments of this country as proof that the threat exists. According to our avowed national policy, these weapons are not for offense against other nations, but solely for the defense of our own. Therefore a threat against our security, vague and undefined though it may be, must exist—else all our war machine is useless junk, built at the behest of war-frightened citizens who have no real cause for alarm.

But as practically all of us agree that some defense is necessary—though we may not agree as to the amount and the kind—it is unnecessary to prove that point, for it stands proved already by our national policy. What I shall try to show informed aeronautical readers—something I could not hope to prove to the average citizen—is that the next major war in which we engage must, *of necessity,* result in an invasion of our country by air.

TO a citizen or subject of a European or Asiatic country, any proof of the probability of aerial invasion is unnecessary. That in time of war his country will be invaded by air, he takes for granted; in fact, he knows for a certainty, beyond the peradventure of a doubt, that such air invasion will be the opening act of the war. He knows that days before the troops of the enemy can be massed at the frontier, before the first rifle, the first piece of artillery can be fired, the air fleets of the enemy will be over his head to deluge him with explosive bombs and poison gas.

Only in the United States does the happy citizen go his way serene, complacent, trusting implicitly in the protecting expanses of water to the east and the west, trusting in the peaceful condition and the financial and numerical inferiority of his neighbors to the north and to the south.

But is this complacency justified? Is is founded on reason—even on sound horse sense? I do not think so. Admitting these protective elements as facts, is it impossible to imagine a change in them, or in conditions affecting them, so that they no longer afford protection?

IMAGINE, if you will, a world war in which nearly all of the nations take part, as they did in the last one? Suppose that England and the United States are not aligned on the same side. To some, such a supposition may be unthinkable—but the world war was unthinkable to most of us until it started. Besides, it would not be the first war that found England and the United States on opposite sides—in fact, the late world war was the first that ever found them together, while three other conflicts found them taking opposite viewpoints—the Revoluntionary War, the War of 1812, and the Civil War, when English opinion, at least, was with the Confederate States. However, I am not suggesting this as a probability but merely suggesting it as a possibility, from which we may deduce some results.

With Canada as a base of operations, with her ports available the year round as debarkation points for all manner of war supplies, troops and equipment; with several excellent airports already available, how long would it be before cities in the northern parts of the United States were being attacked by air?

Look at a map of the United States. The distance by air from Montreal to New York is approximately 325 miles—three hours for bombers; from Montreal to Albany it is under 200—less than two hours for the slowest of war airplanes; from Toronto to Buffalo it is only about sixty miles; from London, Ontario, to Cleveland, Ohio, it is about 100 miles, and to Pittsburgh only 100 more; Detroit is just across the river from Windsor, and Toledo a few miles farther. In short, in air time these important industrial centers are a few minutes or hours from the bases of a foreign power.

However, the friendship of England and America, if guarded by those of their subjects and citizens who are intelligent, will never turn again to enmity. Which is not to say that there is any certainty that the intelligent and far-seeing in either or both countries always will rule, or always have ruled; the stupid, the vicious, the autocratic, the psychopathically nationalistic in both countries eventually may foment war. And if they do, the means of doing damage first employed will be air power.

FEW people can imagine a war with England, but every reader of the yellow press can visualize a conflict with the Soviet Republic. In fact, not only the obviously ill-informed in our country, but also some of the supposedly intelligent representatives of the people in Congress assembled, have a firmly held belief in the reality of the Bolshevik Bugaboo, and the fear that Communism may endeavor to defeat Capitalism by resorting to military methods. This fear, quite by the way, I consider groundless. If the world's system of Capitalism eventually is replaced by some form of Communism, it will not, in my opinion, be brought about by military means; it will occur through the breaking down of Capitalism itself through an inner decay, germs of which already are present in the system in the form of uncontrolled and rising production, spasmodic and lessening consumption, the segregation of money in the hands of the few, the impoverishment of many, and other internal ailments, the external symptoms of which are such growths as our present depression and

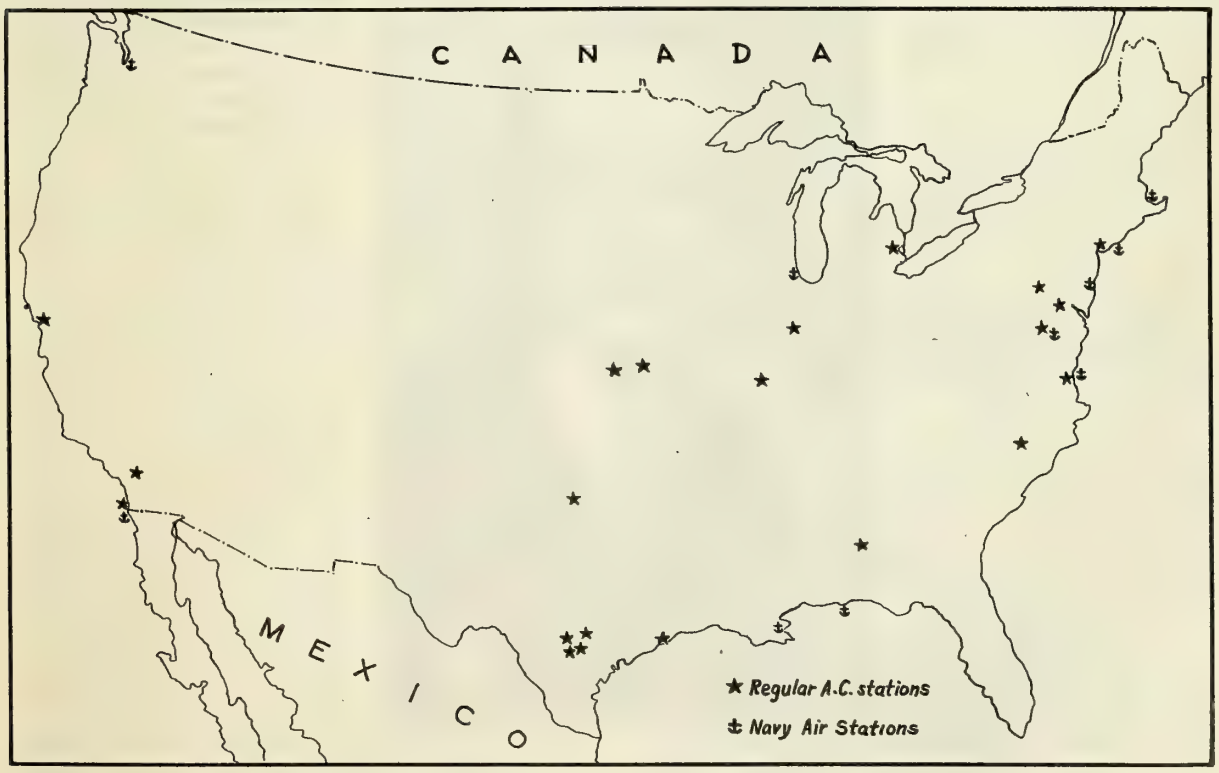
unemployment, the so-called "Red" riots of men out of work, and the general and growing belief in all classes of society that there is something wrong with a system that permits millions to suffer because they cannot buy goods that others would like to, but cannot, sell. Man in the mass, I would remind you, does not generally die from external causes, from being killed in war, or by an accident, or by the act of another man; in general, he dies as the result of some personal internal decay and dissolution of his own. So with Capitalism; if it falls, it will not be because of the conflict with Bolshevism, but because of the germs of decay in its own system, which, if not eradicated, eventually may kill it.

I mention this only to explain why I take no stock in the generally accepted menace of Soviet Russia—at least militarily so far as the United States is concerned. But merely for the purpose of academic discussion, let us suppose a state of war to exist between us and the Soviet. In fact, it is not such a wild supposition, after all, for in any general European or Asiatic conflict Russia doubtless would be involved; and a world conflict would of course involve us again, as it did only thirteen years ago. Thus we might be lined up against the Soviet Republic, even though we had no direct quarrel with them. For instance, we had no direct quarrel with the Turks or the Bulgarians in the last war, yet we were opposed to them in the struggle. For that matter, we had no direct quarrel with the Soviety in 1918 and '19, yet we sent an American expedition against them.

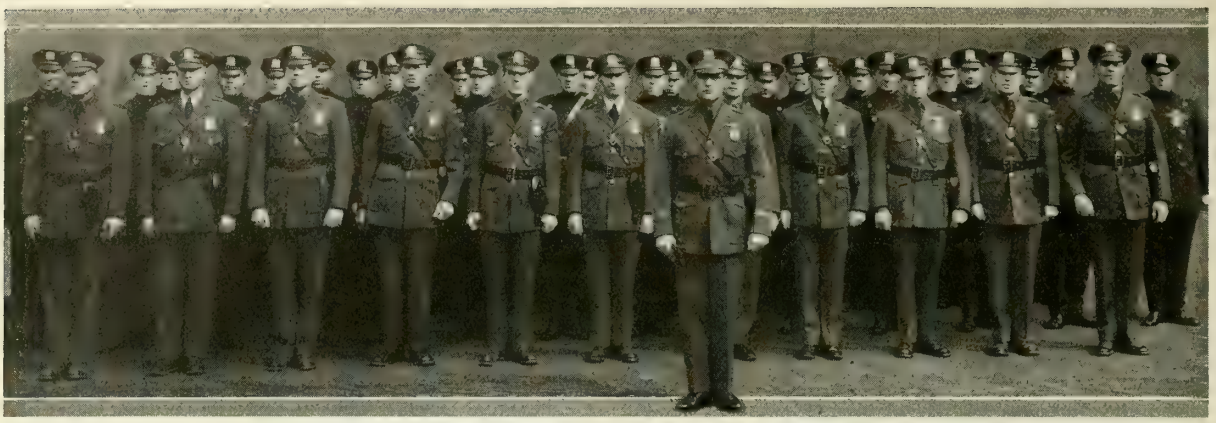
EXAMINE a map of Asia and note how near Siberia, Asiatic Russia, is to our territory of Alaska. The nearest point of Siberia is about seventy-five miles away. Admitting at once the difficulties of waging a campaign in those northern latitudes, the disadvantages would apply also to the American defenders. Be the outcome of a war there what it might, the only efficient way for an enemy to attack and capture Alaska, like the only efficient way to defend it, would be by the use of aircraft. Aircraft are operating there now, when no other forms of transportation except the dog team are moving.

If enough aircraft could be despatched from Russia, and unless we had aircraft in Alaska to combat them, there is no reason to suppose that Alaska would remain in our possession. In a winter operation, of course, our Navy would be useless, for it could not get up there; and even in summer, if it were there, it could not prevent fleets of airplanes from flying over the territory, destroying the country by bombs.

To the charge that aircraft may attack and destroy but cannot occupy a country, it might be mentioned that troop carriers capable of carrying at present forty men and their equipment—the new Handley Page is an example—could bring a considerable ground force in and land it to protect bases in the captured country. From these positions, if they could be consolidated and a line of supplies maintained, there is no valid reason why the planes could not proceed down the coast of British Columbia, eventually to attack the cities of our northwestern Pacific Coast. At least the Army Around-the-World fliers followed that coast up to Alaska and across to Siberia. Is there any reason why the Russians could not follow the same coast down to attack us? As to supplies of gasoline and bombs, and even new airplanes and engines, tramp steamers could land them in any one of numerous protected (*Continued on page* 132)



Map showing locations of Army and Navy air stations in the United States. It is from these bases that aircraft must protect an area of three million, twenty-six thousand, seven hundred and eighty-nine square miles



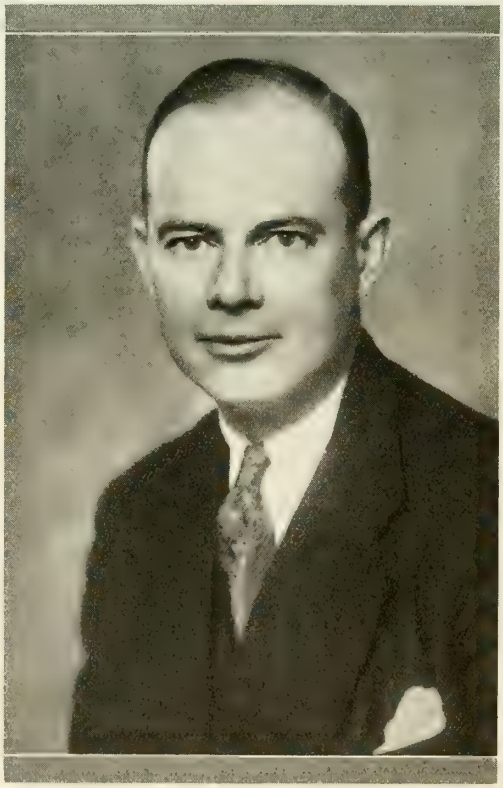
AERIAL POLICE OF NEW YORK CITY

C. B. Allen

WHEN New York's erstwhile Beau Brummel Commissioner of Police, Grover A. Whalen, created an Air Service Division in his Department on September 26, 1929, certain skeptics sagely predicted that it was more with an eye to immediate headlines than to either the present or future needs of the world's greatest city. Some of them doubtless are of the same mind still; others, perhaps, have come around to the point of view that, whatever the motive that brought them into being, the guardians of New York's sky-line have a real job to perform and will justify themselves more and more with the passage of time.

Most of the public probably has forgotten all about the flying police unit, except as it is reminded of the organization's existence now and then when an airplane marked "Police, City of New York" flies low along the waterfront or returns from patrol to its base at the Glenn H. Curtiss Airport, North Beach, Queens. For the spectacular manner of Mr. Whalen has been conspicuously absent from the methods employed by the sky cops in their conservative and serious effort to establish a permanent place for themselves on the force. Consequently, a good deal has been accomplished by the organization and, by the same logic or illogic of quiet achievement, this fact is not very generally known.

Thus it will come as a surprise to most citizens that between April 8, 1929, and September 26 of the same year—the date of the organization of the Police Air Force—there were eight airplane crashes in New York City which cost the lives of six persons and resulted in serious injury to twenty-one others. Slightly less than a month after the creation of the aerial police force and before it had even begun to function, there was another fatal crash when a plane fell into a congested part of the city and killed its pilot. This brought the air casualty score for 1929 to seven killed and twenty-one injured within the limits of New York City alone. With the sky cops on the job nearly all of last year, 1930 passed without a single fatal airplane accident in a congested part of the city. It is true that there were three fatal crashes within the city limits during the year—one in Queens and two at the Barren Island flying field—but in none of these was any one placed in jeopardy save the occupants of the planes themselves and the property damage was confined solely to the wrecked ships.



Arthur N. Chamberlin, aviation secretary to Police Commissioner Mulrooney of New York City

Coincidence might account for these facts, but the contrast seems too striking. The Police Air Force probably is entirely justified in attributing the decrease in killed and injured during 1930, as compared to 1929, to its own efforts at curbing reckless flying in New York's skies. It is impossible, of course, for the air police to protect the reckless and incompetent flier from the consequences of his own foolhardiness and lack of skill, but they can and have protected New York City's man in the street during the last year by forcing the flying public to maintain a safe altitude and by putting an effective damper on stunt flying over congested areas.

Before the New York State Air Traffic Law went into effect

on July 1, 1930, the air cops enforced the Federal Air Traffic Regulations by the expedient of reporting violations to the Department of Commerce inspectors in this district. Under this make-shift arrangement, they brought eleven complaints, in seven of which the offending pilots were either fined or grounded. Action in the other four cases still is pending. Since July 1 three pilots have been called to account under the new state law; one was convicted, one dismissed and the case of the third is pending. The Queens County Court of Special Sessions, in fining $100 the first offender haled before it by the Police Air Service Division, issued a warning to all fliers that in future such offenses (low flying) would result in prison sentences. On the work of New York's air cops in this case, Senator J. Griswold Webb, chairman of the State Aviation Commission, wrote:



Captain A. W. Wallander, uniformed head of New York air police, and Rodman Wanamaker 2nd, honorary aviation aide

"I want to congratulate the Department for its work in this case and I can assure you that, in my capacity as chairman of the State Aviation Commission, I appreciate to the utmost extent the interest and efficiency shown."

But the accomplishments of the aerial police force have not been limited to the maintenance of an orderly sky-line. It will be recalled that the unit started more or less from scratch, albeit the men originally selected for training as pilots had had some experience along this line either in the Army or Navy during the war. In consequence a half-dozen patrolmen student-pilots were sent to Roosevelt and Curtiss fields, respectively, for training, actual daily air patrols of the city not being inaugurated until March 28, 1930, when the aerial police base at North Beach was formally opened.

Since that time the men of the Air Service Division have flown (exclusive of patrols since January 1, 1930) 921 hours and thirty-eight minutes, carrying out patrols on 254 of the 279 days remaining in 1930 after the organization began to function. An additional 555 hours is chalked up to them as time spent in training, giving the unit a total flying time of 1,476 hours when the New Year began. This constitutes an extremely enviable record when it is remembered that the air cops never have figured in a serious accident, still have three of the four airplanes with which they started and have advanced seven of their twelve fliers to the grade of transport pilot—the highest type of license issued by the Department of Commerce.

The other police pilots hold Department of Commerce limited commercial licenses and will take examinations qualifying them for the higher grade as soon as they have accumulated the required number of flying hours. No less than eighteen of the twenty-one permanent mechanics in the Police Air Force hold Department of Commerce licenses, eleven being qualified both as airplane and airplane engine mechanics, four merely as airplane mechanics and the other three as airplane engine mechanics. The three not accounted for in the above classification have just entered the unit from a recently established eligible list of applicants within the Police Department and are to take their Department of Commerce examinations in the near future.

In addition to patrolling the "biggest beat in the world"—the whole of New York City—an average of three times a day during the time it was on duty in 1930 (the sky cops have averaged three hours and thirty minutes flying time a day and a complete circuit of the city by air requires an hour)—the Air Service Division is now so well organized that it is able to carry on its own training program, thus saving the city a considerable expense. It has established an Aviation School within the Police College adjoining Police Headquarters and, with Arthur N. Chamberlin, aviation secretary to Commissioner Mulrooney, as dean of this branch, gave three separate aeronautical courses during the fall of 1930—a Mechanics' Refresher Course, September 15 to 30 with twenty-one students in attendance; a Student Mechanics' Course, October 1 to 31 with eighteen students; and a Pilots' Refresher Course from November 15 to 30 with an enrollment of eleven fliers. The courses consisted of lectures and practical field instruction, Army, Navy and commercial aviation experts liberally assisting Mr. Chamberlin in carrying out this work. A feature of the Aviation School is that all lectures were taken down by stenographers so that they will be available as text books for future courses.

The flying equipment of the Police Air Force at present consists of a Keystone Commuter amphibion, two Savoia-Marchetti amphibions and a Fleet training plane, the latter ship having been purchased for instruction purposes after a third Savoia had been (*Continued on page* 142)



A Savoia-Marchetti and a Keystone Commuter, two of the New York Police Department's amphibions

AIR—HOT AND OTHERWISE

Believe It Or Not

(with the usual apologies to Ripley)

By Frank A. Tichenor

POSTMASTER GENERAL BROWN speaks:

"The military branches of the Government are not at all enthusiastic about the part that civil aeronautics may play in any preparedness program being devised by the Army and Navy. In fact, they speak with some contempt about any aid which might be rendered by those engaged in commercial aviation should the time ever come to call for such assistance."

Such comment from the Postmaster General naturally astounded the Air Mail operators, who at the time were in a conference called for the purpose of improving schedules and working out pay differences under the Watres Act. It stunned with surprise, also, those of us outsiders who know the feeling of the military branches and understand the help that the civil branches actually can give to the military as factors of national defense in time of war.

Naturally the men who best actually know and best really understand have not let this amazing utterance go by unchallenged. Read on, therefore, as Major General James E. Fechet, Chief of the Army Air Corps, speaks:

"My attention has been invited to the statement ascribed to Postmaster General Brown regarding the 'contempt' of the military branches of the Government for civil aeronautics. I am at a loss to understand why any such statement should have been made, as the Army Air Corps has always regarded commercial aeronautics as a reserve in time of war. A large percentage of the pilots engaged in commercial aeronautics and operations for the Post Office Department are Reserve officers in the Army Air Corps and would certainly be used in time of emergency, as they contain in their ranks some of the best pilots in the world, many of them with military experience and many of them trained in the Army Air Corps school.

"The task of converting the industrial establishment from a peace-time basis to a war-time basis requires the most efficient system of transportation and communication."

And now Admiral William A. Moffett speaks:

"I hope that the remarks have not been quoted correctly, for I am sure that no one in naval aviation has ever spoken with contempt about civil or commercial pilots and airmen or what they have accomplished. We have the highest respect for them, and believe that they would be of tremendous value to the country in time of war.

"I have inspected many of the large commercial airlines in this country, and they are unexcelled in their personnel, equipment and organization, and I have the greatest admiration for their progress. While all the commercial planes could not be used for naval purposes, they would be enormously valuable for transportation in time of war, and all would fit into some part of the war organization."

Major General Hanson E. Ely, of the Army, commanding the Second Corps Area, also has answered the Postmaster General, saying "that the training of pilots, the construction of planes and above all the establishment of factories with an adequate output are very necessary to military preparedness. New York, safe from land and sea attack, could be destroyed by air attack while a half hour's bombing and raiding fleet based on aircraft carriers off the coast could wreck and ruin the metropolis, with anti-aircraft guns affording virtually no protection."

After such statements as these from such men as these, the public of America will form its own opinions—in the few instances in which this has not already been done.

The best experts in the country have denied the Brown misstatements. This being true, we find it difficult to believe that they could originally have been made by anyone but Brown himself. Really he should be the last person in the world to risk creating in the public mind the suspicion that he places on the Air Mail, his own service, a value less than that placed on it by chiefs of other services.

At the same conference which listened to his tirade of inaccuracies, Brown told the operators there would be a governmental deficit of $150,000,000, but did not say how much of this would be chargeable to the Air Mail. We estimate that that amount really will be between two and three millions. At the same time we note that the Postmaster General did not mention that REAL deficit, amounting to more than fifty millions, arising from the transatlantic mail. Nor did he speak of the deficits of the Rural Free Delivery System and mail carried by the railways.

Blame the deficit on the Air Mail, the public is gullible, seems to be the Brown determination—for Brown is an alleged politician.

Less playing of Brown politics might have left a smaller deficit all along the postal service line, even in Air Mail. More service to the public and greater fairness would improve the situation generally. Former Postmaster General Hitchcock was the first to adopt Air Mail. He ran the Post Office without a deficit of any kind. And, incidentally, he created among 350,000 subordinates in every branch a sense of good-will and respect for their chief, unparalleled today, while giving to the public a service that will long stand as a model—one not lived up to today. Never since I have been listening to such signs have I heard so many comments unfavorable to any cabinet officer as now are being grumbled about Brown. So here are thirty-one words meant for his special benefit:

What the public needs, Mr. Brown, is not less Air Mail but far less scheming. What the postal service needs more of, besides Air Mail, is business methods and fair dealing.

Now to continue with our comment:

One of this man's interesting plans is close to good old bunco. It is for a 2½-cent standard first-class postal rate, very probably with the idea that the purchasers of single stamps will be so numerous (why buy two for five when you need one and are sure to lose the second or wear it out in pocketbook or vanity case?) that the virtually pilfered half cents will be numerous enough to help wipe out that mighty deficit which is so black a stain, not upon Air Mail, but upon Brown management.

Is it Brown's idea that the pockets of the people who own the Post Office should be picked for funds with which to cover his incompetence?

Behind thick walls in Atlanta are men sent there because of somewhat similar calculations. They might have done far better; Brown might do far better.

WHY THEY JUMP

By Lyman H. Ford

Irving Air Chute Company

TAKING the figures from approximately ten years from the time the first life was saved by the free-type manually-operated parachute as made by the Irving Air Chute Company, Inc., of Buffalo, N. Y., it is keenly interesting as well as important to note the causes of the trouble which resulted in jumps.

The first life saving jump was made late in August, 1920. Up to the close of 1930, fully 375 jumps had been made for life-saving purposes with Irvin air chutes. Some aviators had jumped more than once, and one flier, the famous Colonel Charles A. Lindbergh, had used this chute to save his life four times.

From the total number of emergency jumps actually made and recorded with the Irving management, there have been compiled sufficient details by which adequately to judge the actual causes of the jumps in 329 cases. In the vast majority of the cases there was nothing else that the man wearing the chute could have done to save himself and the ship. In other words, in about 95 per cent of the cases, the pilot exhausted every known means to save himself and his ship before resorting to the chute. Even in the small remaining minority whether or not the pilot did not use every means and every bit of skill at his command to save himself without using the chute is highly debatable. Probably those who might be inclined to judge harshly would not have done as well under the same circumstances.

To carry the basic thought behind these important figures still further, there is much to indicate that had it not been for the chute there would have been tragedies in each of these cases and the loss, through no fault of their own, of many valuable aviators' lives.



Descending slowly toward the earth

By far the greatest number of jumps were occasioned by failure of controls in one way or another. There were a total of 100 in 329 cases, or 30.39 per cent—most of which were the result of the failure of the ship to answer controls and return to normal flight attitudes from spins or other unusual maneuvers. It may be argued that the inexperience of the pilot may have contributed to such accidents. True, but on the other hand, some of the most experienced pilots have been the unwilling victims of spins. Nevertheless there is hardly a case in which it is not self-evident that the pilot exhausted every means in his power to bring his ship under control before resorting to the chute. In most cases, the fliers waited much too long before leaving the ship, several having been saved after jumps made less than 100 feet from the ground.



A free-fall jump, hand on rip cord

Controls failed in some cases—a very small percentage — in normal flight. The pilot suddenly found them jammed, a cable loosened, an aileron loosened. Obviously, in such cases it is rather difficult to consider the pilot in any way at fault. In connection with control failure, particularly in spins, it should be mentioned that a large percentage of the cases were during tests of experimental ships or those being tested after repairs.

The next greatest number of cases may be classed as resulting from structural failures. They number sixty-three, or 19.14 per cent of the total. Most of them represent the breaking up of a ship in the air, usually during maneuvers, other than in collision. In most of these cases also the situation was utterly beyond the control of the pilot—impossible for him to foresee. Many of these cases also involved the testing of experimental or old ships. Only in one case did a pilot deliberately take up a ship on a bet or a dare that he could not fly the wings off it. After putting it through a gruelling test, he faced the loss of his $500 bet, but finally it tore off its wings in a power dive and he saved himself with his chute and won his bet.

Fifty-nine emergency jumps, or 17.93 per cent., were made from ships in collision. Most of these were ships in the military services flying in formation or maneuvers. Here, it may be charged, the skill of the pilot was involved to a great extent. Perhaps. But how about such items as flying into the slipstream of another plane, of a ship suddenly lagging because of motor trouble, of two ships suddenly coming upon each other so quickly out of clouds that they cannot avoid hitting?

Fire accounted for twenty-nine cases, or 7.29 per cent, while motor failure accounted for twenty-one, or 6.38 per cent. Perhaps these should be placed in the same category because fire usually indicates motor or ignition failure. In any case the trouble could not have been foreseen and the greatest faults of the pilots seem to have been in staying with their ship much too long in an effort to land.

Curiously, there were nineteen cases of pilots or passengers being unexpectedly thrown out of their ships and coming down with their parachutes. Certainly they would have had no chance with-

(*Continued on page* 153)

TREND of the TIMES

By David Lawrence

CURRENT conversation on the depression reveals a notable emphasis on morale. The country can go from the dismal depths of December into the gentle heights of January and feel that it has made material progress. Contemporaneously, some unfavorable developments can appear on the horizon and when the markets show a rugged resistance thereto, we are made to feel that somehow the worst has passed.

What we are lacking, indeed, is a yardstick. Or perhaps it ought to be called a perspective. The difficulty is that most of us have not been through an experience similar to the present depression and we are, therefore, expecting a return of "normal business" with every confidence that what has been in the past will be once more. The wiser heads tell us that while we may properly become sanguine about the future in due time, we need not be disappointed if the next era is an entirely different one from that which preceded it.

Business men in 1931 already are altering their methods and rearranging their affairs so that new sources of revenue may be found.

Basically, the year 1930 saw what may be termed a reckless curtailment of expenditure. The term "reckless" is used advisedly because some of the larger corporations of the country became so panicky over the importance of retaining their earning of other years that they thought the way to accomplish that result was merely to cut down one side of the operation. They forgot that much of the expense built up in boom time was based upon the sound theory that in order to make money, business has to expend money.

There is no doubt that considerable waste and extravagance has prevailed and is more likely to become extensive in times of prosperity than in times of depression. But judging by the way some of the major industries reacted to the drop in business during 1930, one would have thought that the entire sales mechanism was founded on a false premise in the first instance.

What has happened recently is that as business has regained confidence in itself, there is a natural return to the expenditures which previously proved productive. Certain products cannot be sold except by personal selling. Other goods can only be distributed as a result of carefully planned appeals to the public. It is significant that several companies had a better year in 1930 than in 1929. These concerns are going forward confidently. Evidently, not a few companies which had no reason to curtail operations except an intuitive fear of catastrophe that never materialized now recognize the time spent in hesitation was expensive, indeed.

Caution is, after all, a virtue which can never be denied. But there is on the other hand another business attribute which so often spells success in modern business. It is the faculty of knowing when a sound economic basis for the distribution of a product has been reached and pushing ahead with all possible force for sales so long as the response is at all commensurate with the outlay.

Most significant in recent developments has been the continued stabilization of several factors which were more or less unsteady in the latter part of last year. Thus, the credit situation has improved substantially and the industrial companies which needed refinancing are finding a better market for their securities. Some of the larger issues of securities or bonds reveal how the bigger corporations managed their expansion programs during 1930. Apparently, large bank loans were made which are now being paid off with the proceeds of bond issues. Thus we see how important it was to provide a good bond market in the early part of 1931.

While here and there, the aftermath of 1930 is giving considerable concern, individuals as well as businesses have now settled down to a long, steady pull. The idea that good business would come in through the window or through the door without any effort being made to get it has apparently been erased from the minds of many business executives who thought that normalcy was inevitable as a matter of course and that sufficient momentum had been achieved in 1929 and early part of 1930 to ride along constantly on the crest of previous sales effort.

Today's sales are being sought with more intelligence, with more power, and with more carefully planned expenditure than at any time since pre-war days. Competition is keen in many lines and this has only challenged the ingenuity of American business the more insistently. We have witnessed in recent weeks an interesting series of sales efforts by some of the largest publications in the country which have refuted what appeared to be an excess of hesitation. The reminders that it is just as easy to go in one extreme as in another during a depression have been forcefully portrayed in large advertisements before the business public.

The significance of this drive which is all a part of the psychology of depression will not soon be lost on the American business man. For whatever may be the arguments in the executive committees and the boards of directors about the pulling power of advertising as a sales force, the fact remains that appropriations have been gradually cut down ever since the beginning of the depression. Publications which have always had faith in the value of advertising as a means of selling products were not very quick to realize how much slashing of advertising appropriations was going on until the latter part of 1930. Then they began to issue their warnings. They brought forth tables to show that during the 1921 depression the companies which kept up their advertising appropriations came out of the storm with many more assets than their competitors.

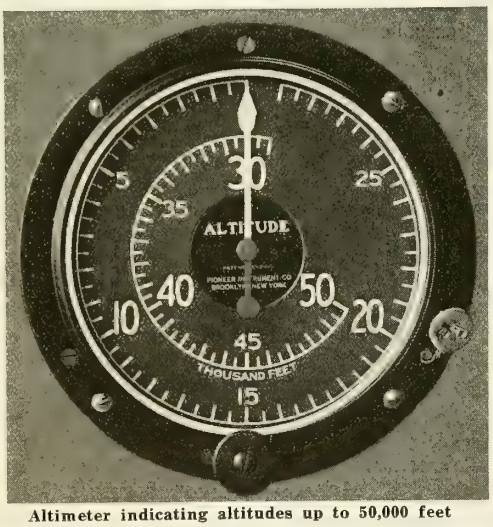
Looking ahead into the early months of 1931, we find that most of our business men have come to the conclusion that the world, after all, is not going to come to an end and that if three per cent of our people are unemployed, attention must be given to the needs and wants of the ninety-seven per cent who are employed and who have money to spend. The situation, of course, is far from clear and the business world has about adjusted itself to the belief that it may take two or three years before anything approaching 1929 earnings will be experienced. But there were many good years even before 1929 and many a business executive will be happy if he can approximate the returns of 1927 or even 1928. The process of recovery is proceeding. Much of it is painful and most of the reorganization has yet to be done. But the difference between the first quarter of 1931 and the last quarter of 1930 is a difference in underlying feeling.

THE PILOT AND HIS ALTIMETER

By
Lt. Logan C. Ramsey, U. S. N.
Author of "The Naviation of Aircraft";
Instructor in Aerial Navigation,
Naval Air Station, Pensacola, Florida

THE measurement of the altitude in aircraft is effected by means of the altimeter. This instrument is basically an aneroid barometer with its dial graduated so as to indicate changes in elevation above sea level instead of changes of atmospheric pressure in inches of mercury. These graduations are calibrated for certain "standard" conditions of atmospheric pressure and temperature. In the United States this standard is considered to be an atmosphere with a sea level pressure equal to 29.92 inches of mercury and a temperature of 50 degrees Fahrenheit or 10 degrees Centigrade.

Obviously, any change from these conditions will produce an error in the indications of the altimeter. In the temperate zones, although greater variations have been observed, the usual range in sea level barometric pressures is from a low of 28.40 to a high of 30.30 inches of mercury. Similarly, in those regions, the normal range of sea level temperatures is seldom above 100 degrees Fahrenheit or below zero degrees Fahrenheit. The usual range of pressure variations would cause a maximum initial error in the reading of the altimeter of approximately 1,500 feet, whereas the extremes of temperature would have practically no effect at sea level but would cause an error of about 100 feet by the time an altitude of 1,000 feet was attained. The relative magnitude of these two errors has resulted in the introduction of a means of compensating the altimeter for changing pressure conditions. The effects of the temperature changes, however, have been generally disregarded. The means adopted for setting the altimeter to the existing atmospheric pressure consists of a movable dial actuated by a knurled knob. If the dial is rotated, by means of this device, until the reading of the instrument is equal to the elevation above sea level of the airport upon which the plane is standing, then the altimeter is adjusted to the existing local atmospheric pressure.



Altimeter indicating altitudes up to 50,000 feet

Whether or not additional corrections must be made to the readings of the altimeter depends upon the mission on which the pilot is engaged. For ordinary flights around the airport or for very short cross-country flights over level territory, the indications of the altimeter, adjusted as just described for the existing barometric pressure, may be accepted by the pilot as the true altitude. The conventional altimeter, under these conditions, is accurate within 10 to 15 per cent of the reading.

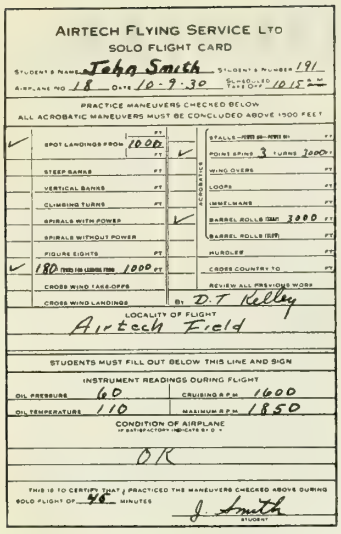
If, however, the pilot is to make a passage flight of more than, say, 100 miles in distance, the navigation of the plane becomes a vital matter and an additional correction should be made to the altimeter reading. In setting the altimeter as previously described to read the elevation of the point of take-off, the pilot has adjusted his instrument to the pressure existing locally. Considerably different conditions may obtain at his destination. Hence it is safer to set the altimeter, prior to taking off, to correspond to the atmospheric pressure obtaining at the other end of the projected flight. If the altimeter is fitted with an auxiliary scale showing the barometric pressure in addition to that depicting the altitude graduations, this is done very simply by rotating the dial until the zero of the altitude markings coincides with the reported barometric pressure prevailing at the destination. Then, when the plane reaches the terminal airport and its altimeter registers the elevation of that place above sea level, the plane will be in contact with the ground. Some will wonder why the elevation of the destination above sea level is not brought into coincidence with the reported pressure existing at that point. The reason this is not done is that all weather observers, after reading their barometers, reduce the pressures so recorded to a corresponding *sea level* pressure before broadcasting them. Hence, weather reports give the corresponding sea level pressures rather than the actually observed readings.

However, in many instances, altimeters are not fitted with the pressure scale in addition to the conventional one indicating altitudes. In these instances, it will be necessary for the pilot to do a little arithmetic. One-tenth of one inch of mercuric pressure is approximately equal to an altitude of 90 feet. The standard pressure is, as previously stated, 29.92 inches. If the reported pressure at the destination is greater than the standard, the altimeter must be set, prior to take-off, to a reading higher than the known elevation of the starting point of the flight. Conversely, if the reported pressure is less than 29.92 inches, the altimeter is set to a reading less than the known elevation.

For illustrative purposes, let us assume that we are at El Paso where the elevation is 3,900 feet above sea level. We are to fly to San Antonio. The weather report comes in and gives the pressure at San Antonio as 30.12 inches. To what reading should the altimeter be set before we take off?

Pressure at destination ..... 30.12 inches
Standard pressure ..... 29.92 inches

Pressure difference ..... 0.20 inches
Correction @ 90 feet per (*Continued on page* 128)



AIRTECH FLYING SERVICE LTD
SOLO FLIGHT CARD

Student's Name John Smith Student's Number 191
Airplane No. 18 Date 10-9-30 Signed Out 10:15 A.M.

PRACTICE MANEUVERS CHECKED BELOW
ALL ACROBATIC MANEUVERS MUST BE CONCLUDED ABOVE 1500 FEET

✓	SPOT LANDINGS FROM	1000 Ft.	✓	STALLS	Ft.
	STEEP BANKS	Ft.		POINT SPINS 3 TURNS	2000 Ft.
	VERTICAL BANKS	Ft.		WING OVERS	Ft.
	CLIMBING TURNS	Ft.		LOOPS	Ft.
	SPIRALS WITH POWER		✓	IMMELMANS	Ft.
	SPIRALS WITHOUT POWER			BARREL ROLLS (Start)	3000 Ft.
	FIGURE EIGHTS	Ft.		BARREL ROLLS (Exit)	Ft.
✓	180 (Type)	1000 Ft.		HURDLES	Ft.
	CROSS WIND TAKE-OFFS			CROSS COUNTRY TO	Ft.
	CROSS WIND LANDINGS			REVIEW ALL PREVIOUS WORK	

By D.T. Kelley

LOCALITY OF FLIGHT
Airtech Field

STUDENTS MUST FILL OUT BELOW THIS LINE AND SIGN

INSTRUMENT READINGS DURING FLIGHT

OIL PRESSURE	60	CRUISING R.P.M.	1600
OIL TEMPERATURE	110	MAXIMUM R.P.M.	1850

CONDITION OF AIRPLANE
OK

THIS IS TO CERTIFY THAT I PRACTICED THE MANEUVERS CHECKED ABOVE DURING SOLO FLIGHT OF 20 MINUTES
J. Smith
STUDENT

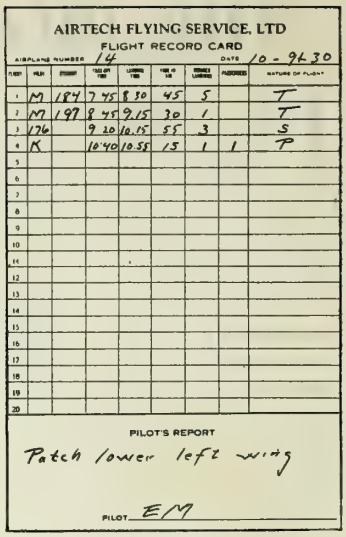
THE BUSINESS OF RUNNING A FLYING SCHOOL

By

I. N. Lawson, Jr.

President, Airtech School of Aviation

Article 1: Field Operations, Flight Schedules, Student Appointments



AIRTECH FLYING SERVICE, LTD
FLIGHT RECORD CARD

Airplane Number 14 Date 10-9&30

Flight	Pilot	Passenger	Time Off	Time In	Hours Flying	Landings	Passengers	Nature of Flight
1	M		184 7 45	8 30	45	5		T
2	M		197 8 45	9.15	30	1		T
3	176		9 20	10.15	55	3		S
4	K		10.40	10.55	15	1	1	P
5								
6								
7								
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PILOT'S REPORT
Patch lower left wing

PILOT EM

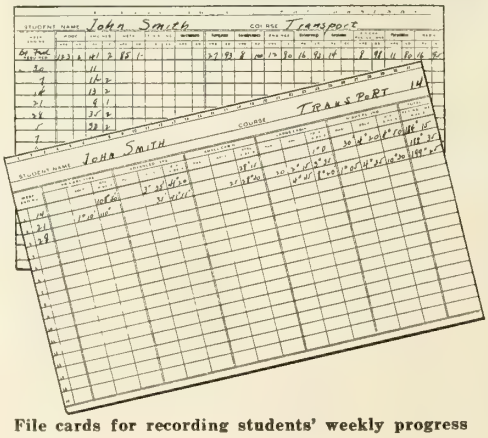
STUDENTS of airport facilities is perhaps the most efficient method of imparting actual working knowledge of airport management. For this reason advanced students of Airtech School of Aviation, working under the supervision of licensed mechanics, are intrusted with airport jobs which do not over-reach their abilities. Besides being commendable from an educational standpoint, this policy has sound economic recommendations.

The school's location on Lindbergh Field, municipal airport of San Diego, California, allows the students a wide range of flying field activities. Students on the line direct transient ships to their places and direct pilots to the field office to register. A mechanic checks the visiting plane and notes on a courtesy card the amount of gasoline and oil required and whatever repairs are believed necessary.

A charge of one dollar per night is asked for hangar storage, except the first night which is free. Nine out of ten visiting pilots buy gasoline and oil, and a large percentage, appreciating the inspection their planes receive, order repair work done. When the pilot is ready to warm up his engine, one of the Airtech organization spins the prop or cranks the inertia starter.

This extensive service to transient planes produces results that are beneficial in two ways. Besides adding to students' experience and knowledge, it creates good-will of incalculable value for both Airtech and Lindbergh Field and in that way is excellent advertising.

Under the school's original plan of operation, flight schedules were made out daily and posted on a board in the hangar. Students were obliged to be on hand and fly at the time alloted to them by the chief of the flight training department. It was found, however, that this policy in many cases was inequitable. A student pilot lacking in the number of hours flown in proportion to his progress in the ground school might be scheduled for one-half hour of flight. Another student behind in ground school but with more flying time might be scheduled to fly for an hour. A new method was put into practice, proving most satisfactory. It has increased the total hours of flying time per day materially and thoroughly satisfies the students.



File cards for recording students' weekly progress

Primary students training begins at 8 o'clock in the morning. In the front cockpit of each ship is a flight instructor, with a student in the rear cockpit. The Gossport system of communication between instructor and student is used. Following the primary instruction period, the intermediate students are taken up for the length of time the instructors deem needed. In no cases are instruction flights of less than one-half hour duration.

In the meantime, the other students are grouped (from two to four in each group assigned to a plane), under supervision of an instructor, to assist in servicing planes with gasoline and oil and making needed minor repairs.

Usually after the intermediate student flights in the morning, the planes are taken aloft by solo students. Instructors remain on the ground with their groups, pointing out details and criticizing the work of solo students who are in the air, for the education of the primary students.

During the time that primary students are receiving morning flight instruction, the advanced students are attending ground school classes. In the afternoon, this procedure is reversed.

From twelve to one o'clock is the lunch hour and from one to two o'clock (daily except Friday, Saturday and Sunday) students participate in some athletic activity. Indoor baseball, handball, tennis or horse shoe pitching are the most popular sports. Following the athletic period, those who received flight instruction in the morning go to ground school classes.

Since the installation of this

method of instruction the total flying hours per month has increased approximately twenty-five per cent. Anyone operating a school will appreciate the fact that the more hours which may be flown without the addition of new equipment, the greater the profit for the organization.

One of the outstanding factors which contribute to the successful operation of an aviation school is the practical application of business principles, especially in the accurate accounting of operation costs.

There are, I believe, two elements to consider in arriving at an accurate cost accounting system. First comes the cost per flying hour. This is based on gasoline and oil consumption, mechanical labor, maintenance, repair material replacement parts and depreciation on engines and airplanes. Second is the fixed overhead of salaries, wages, office expense, field rent, sales expense, supplies, equipment, advertising, insurance, and depreciation on fixed assets.

If accurate records are kept over a given period of operation, it is much easier to outline budgets for future operation, and thus it becomes possible to keep the working capital active. It is essential to reduce the cost of operation to a minimum. This can be done only where facts and figures have been collected and carefully analyzed. It is then possible to know where to reduce costs.

The collection of facts and figures is very important, and for this purpose the proper charts, forms and blanks must be efficiently designed and faithfully kept. Forms in use at Airtech have been developed after a thorough study of those used by the Army, Navy and several commercial operators. They may be divided into two groups: those for maintenance of airplanes and equipment; and records of students. The first group has direct bearing on cost accounting.

The daily inspection form is filled out by the man who inspects the airplanes. We have found it best to have this inspection made by a licensed pilot who is not engaged in the mechanical departments, since it is easy for a mechanic who is to do the work to be lax in the inspection.

From this form the chief mechanic of the night maintenance crew can outline the work to be done each night to put the plane into first-class condition. A careful inspection is important, and it is deemed advisable to have a suitable form which will guide the inspector and make the inspections uniform.



Lieut. Commander P. V. H. Weems with a group of Airtech students

Before the planes are flown next morning the pilots carefully check each repair. If the work is acceptable it is so noted on the forms, which are then delivered to the operations clerk to be filed for reference.

A daily maintenance report is kept by the chief line mechanic who records the airplane number, gallons of gasoline and oil put aboard, mechanical repair and service work done, and materials used. At the foot of the report is a place to note the amounts of gasoline and oil on the service truck. It shows the number of gallons received, total gallons dispensed, and the balance on hand. The operations clerk totals the amounts daily and keeps the reports until the end of the month.

The daily operations report, containing much valuable information, is kept by the man in charge of the line during flying hours. The report for each flight gives the student's or pilot's number, destination of flight, expected duration of flight, condition of safety belt and parachute, oil pressure and temperature reading, the proper functioning of first the left, then the right and finally both magnetos, actual take-off and landing time, gallons of gasoline in the plane, and remarks. All these items are checked for each flight. While the engine is being warmed, the mechanic in charge personally sees that all instruments are functioning properly and that the safety belts and parachutes are in good condition and properly adjusted. This report is filed with the operations clerk each night.

Airplane log books are made up daily by the flight office from the operations report and are certified to by the airplane inspector. Information from the log books is posted in the hangar under properly headed columns on a daily maintenance chart.

This daily maintenance chart informs the mechanics as to the flight hours of each plane, the proper time for changing oil and spark plugs, checking propellers, and other work required after a given number of hours. The chart contains columns for the following data: plane number, engine type, Department of Commerce license number, manufacturer's engine

(*Continued on page* 126)



Location of Airtech School at Lindbergh Field, San Diego, California

EDITORIALS

CONGRESSIONAL PENURY? OR—

AT about the time this magazine reaches our readers Congress will have adjourned. Its appropriations committees will have pared to the painful quick everything connected with aviation: funds for the Army Air Corps, funds for Naval aeronautics, funds for the Air Mail. Why?

Because the industry lacks leadership in Washington. Don't blame it on the other fellow, though he's bad enough. It's our own fault.

This short session ought to have adopted a new program, appropriating for new Army aircraft at least fifty million dollars annually during five years, with like sums allotted to the Navy for like purposes. And what do we get? Count it on your fingers! (You won't need all of those on your left hand.)

Fearing exactly this, AERO DIGEST urged organization in the industry to prevent such a disaster and create that favorable situation which is essential not only to the welfare of the industry, but to the safety of the nation.

But what's the use of complaining? We have ourselves to blame. We ourselves are at fault. We are not organized to procure progressive aircraft legislation either at Washington or at any of the state capitals. Until we really and competently organize we must expect exactly this sort of treatment.

Hence, we must not blame Congress; we must blame ourselves. Congress has other things to think about—things that are energetically brought to its attention by energetic men with energetic minds who know what they want and start out earnestly and intelligently to get it. Educate Congress in what aircraft can do to make this nation great and it will play its part.

But don't let's cry over spilled milk. Let's watch our milk, hereafter, and guard it against spilling. When the next Congress meets we must keep in mind the thought that God principally helps those who help themselves.

THE DYNAMIC SAILORMAN

THE entire industry might profitably study—Admiral Moffett. He works harder for it than it works for itself—harder and more intelligently.

During the final days of the late and unlamented session of Congress, he strove not only for the Navy's Bureau of Aeronautics, but for everything pertaining to our national defense. If throughout the dying moments of a curiously sad-souled session Admiral Moffett could have multiplied himself by ten, or if we had nine other workers each as able, aviation's participation in Congressional appropriations would have been ten times as great.

If some of the power groups who are trying to grab Muscle Shoals could kidnap Admiral Moffett and, for a hundred thousand or a million a year, induce him to work as he worked for aeronautics while the session was approaching its ignoble end, they would possess a human reservoir of directable strength comparable with that hydraulic force which they have been trying to possess improperly through strategy.

He is the only living 100 per cent human dynamo, with his capacity for the production of progressive force so ceaseless that it nearly solves the long sought perpetual motion.

OUR GROWING LIST OF AIRPORTS

UP to January 1st, 1931, cities, business corporations and individuals had established in the United States 1,113 airports, representing a financial investment of $115,068,500. These figures are announced by the Aeronautic Branch of the Department of Commerce, which further states that planned expansion of airport facilities will cost $20,225,000, without counting in a penny to be spent on brand new airports. This money represents cash already allotted to be spent upon enlargements and improvements of ports already in existence. The last cent of this money will have been spent before this year comes to an end.

Despite the interest which municipalities are showing in public airports, about half of the investment named has been privately made in commercial airports, these outnumbering similar municipal facilities, at the present moment, by fifteen. Municipal airports total 549 and commercial airports 564. Only about $2,000,000 excess in investment can be credited to the municipal airports, commercial airports representing an expenditure of $56,856,500 and municipal airports $58,212,000.

WHO IS "KILLING" THE NAVY?

THE charge that "Socialists and Bolsheviks, Communists and pacifists of butterfly ideals" are "making a monkey" out of the Navy and a "scrap of paper" of the London Treaty was made by Congressman Britten because of the rejection of the $74,000,000 construction bill providing for one flying deck cruiser, one aircraft carrier and four submarines. We are in full accord with Congressman Britten's feeling that someone is "making a monkey" of America's Navy and a "scrap of paper" of the London Treaty. But we cannot agree that this lamentable situation may be attributed to "Socialists and Bolsheviks, Communists and pacifists of butterfly ideals." Secretary Adams is no Socialist, no Bolshevik, no Communist, no pacifist of butterfly (or any other) ideals. Socialists, Bolsheviks and Communists at least believe in some species of majority rule. When Secretary Adams allowed the elimination of the aircraft-carrying ships which would have done something toward modernizing our Navy, and the substitution therefor of the $60,000,000 battleship reconditioning program, he weakly and very stupidly played into the hands, not of outrageous radicals, but of cynical reactionaries. The radicals at least imagine they are patriots; the reactionaries know they are not patriots and have in mind one object only, the preservation of soft snaps for the old-line Naval crowd. And this in spite of the fact that the old-line Naval defense ideas are actually as obsolete (and for the nation's good should be sunk as deep in the salt) as any antedated warship condemned for use as a target in fleet gunnery practice.

MATHEMATICAL WING SECTIONS

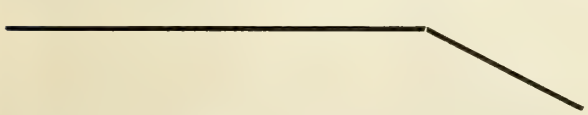
Dr. Max M. Munk's Ninth Article on the Principles of Aerodynamics

MOST wing sections in the past were laid out by the designer simply on the basis of his artistic feeling and practical experience. Only comparatively recently have wing sections come into actual use which comply with strict mathematical rules and can be computed by specific mathematical equations. The "M" sections developed by the author are an example of such sections. Both the true significance of mathematical sections and their logical connection with aerodynamics are still widely misunderstood. In order to avoid overestimating such sections, or feeling handicapped by lack of sufficient knowledge about them, the designer ought to have a clear picture of what their mathematics means and does, and what it fails to mean and do.

There is the contention that no fundamental difference exists between mathematical and non-mathematical wing sections, because every section can always be represented by some kind of mathematical rule. The difference between mathematical and non-mathematical wing sections is one of degree only. The simplicity or complexity of the mathematics necessary to describe the curve may be of different degree, and the mathematical curves supposedly require comparatively simple mathematics. But such vague differences in the degree of simplicity cannot make any fundamental difference in the aerodynamic properties.

This argument does not dispose of the possible fundamental differences between wing sections complying with specific mathematical laws and those which do not. Such fundamental possible differences (if existing) would not, however, be known to us. Specific mathematical laws underlying the design of highly efficient wing sections would have to be derived from the mathematical theory of wing section aerodynamics. The theory, as far as our discussion goes, does not hinge upon the question of obtaining good wing sections. Referring to mathematical and empirical wing sections alike, it does not tell anything about the drag or maximum lift. So far as the theory is concerned, all wing sections are equally good except for different rates of center of pressure travel. This is exactly what should be expected, because the important differences between wing sections are caused by the deviation of wing section flow from potential flow, and no theory of potential flow can give information on that. Only a theory of air friction could. We do not, however, possess any serviceable air friction theory explaining the cause of drag and prevention of a high lift. If we have not even a satisfactory physics of air friction, how then can we expect mathematics of air friction?

From all this it follows that we cannot know from pure reasoning about any class of superior mathematical wing sections, and hence we cannot know about them at all. The merits of any wing sections, mathematical or not, are known to us only from rather direct experience. Any mathematical wing section will have difficulty in claiming superiority on mathematical arguments only. In the drama of inventing better wing sections, mathematics has to be satisfied with a minor rôle.



Graphical representation of mean camber line of stabilizer and elevator

That means in no way that mathematics is useless for the wing section design, or that we may ignore mathematical wing sections. On the contrary, it is quite likely that in future years, when we shall gradually come to undertake aerodynamic research work more systematically and scientifically, mathematical wing curves will increase in importance. The "M" sections are merely the first step in that direction. Simple mathematical equations are a guarantee for complete regularity and harmony of the shape, and for that reason alone are a useful tool for developing better sections. It is plausible that a more perfect airflow is invited by a wing section extremely free from irregularities, including those invisible to the eye, provided simplicity of geometry is combined with the general characteristics necessary to a good section. The circle and the ellipse are both very simple and perfect from the mathematical point of view, but they are unsuitable as wing sections.

Regularity of mathematical wing sections is not their only attribute. A second important advantage is the ease of classifying and systematically varying mathematical curves. This advantage should be decisive in their selection in systematic laboratory investigations. The equations of the sections contain a number of constants, and by varying these numerical constants separately or in systematic combinations, highly bred wing sections can be developed, hunted out, or caught with comparatively little experimental work. Such tests also cover much more ground than an equal amount of experimental work done at random or guided by mere guess.

There is, finally, the advantage of getting a fuller understanding of the shape of a mathematical wing section. Each constant in the equation stands in direct relation to specific geometrical characteristics, and expresses therefore certain aerodynamic features of potential flow, at least. A conscientious and skillful research engineer prefers to take this into consideration. Research, like war, is obliged to utilize every means to its desired end.

For all these reasons it is easier, in systematic research work, to find good mathematical wing sections than non-mathematical ones. It is doubtful whether the latter are quite as good; at any rate they are harder to discover, and will therefore eventually lose in relative importance. They survive now chiefly because of the present absence of systematic wing section research. The "M" sections were intended to serve as the beginning of such systematic research, and as a beginning, they were highly encouraging. The first series furnished improved sections readily adopted by the praxis. Unfortunately, the investigation from which they were evolved had to be discontinued for administrative reasons just when its value was becoming apparent. It can only be hoped that it will be revived at some future time. We shall later discuss in detail the mathematical

(Continued on page 122)

INVESTIGATION AND DEVELOPMENT OF THE BURNELLI TYPE AIRPLANE

By Dr. Ing. F. Wertensen

THIS article sets forth results and derivations of the investigation of the Burnelli type airplane, as a sequel to Dr. Wertensen's article in the January issue of AERO DIGEST. This article deals with the performance of different applications.

AN important alleged technical objection to wide fuselages with engines mounted in front is, not the mere resistance of the streamline bodies, but the slipstream interference. This objection is sometimes applied to the Burnelli type fuselage. Consideration of this point discloses, however, that the blanketing of the wide body of the UB-20 amounts to not more than 27 per cent, favorably comparing with more than 30 per cent by the nacelles and the projected area of the wing of a conventional multi-engined plane (see Figure 1). In fact, in this matter the wide fuselage is very satisfactory as regards least slipstream obstruction. Advanced European development reveals the tendency to eliminate nacelles by installing engines in the wing with propellers directly ahead. The problem of the effects of interferences with propeller efficiency is a matter of degree depending on the distance of the propellers ahead of the obstruction and the contour of the latter.

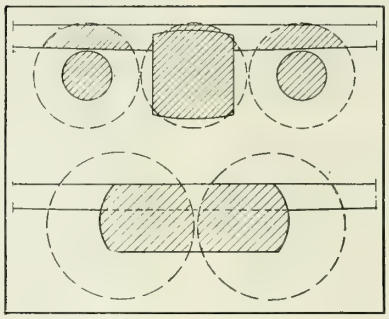


Fig. 1. Comparison of propeller blanketing for nacelle and Burnelli type planes

The cooling system of the Burnelli is important in this connection. Installation of the radiators in the entering edge of the body, behind the most effective part of the propellers, yields excellent slipstream relief and cooling effect. The radiators of the UB-20 were intended to cool 550 horsepower each. Reserve cooling is available for the two Packard 750-horsepower test engines installed. During a trip from New York to Chicago on which I was a passenger, the shutters were not fully opened though outside temperatures were more than 85 degrees Fahrenheit. With power on and maximum velocity through the cooling core at all attitudes this indicates a condition which is aided by the venturi effect from the suction at the side outlet. When the plane is climbing and the slipstream most pronounced, the shutters are open for maximum cooling and slipstream relief for the body area is most effective.

The efficiency of a cooling system must not, however, be considered only from the viewpoint of cooling effect and reduced weight, for the drag is of vital concern. Recent wind tunnel investigation brought out the possibility of greater drag reduction for the UB-20 arrangement. Research is still under way to obtain the best conditions for entrance opening of core, tunnel contour and location of outlet. We find that drag can be substantially reduced.

The main point in the investigations mentioned in the previous article was the coöperation of wing and body; it was explained that the body is lifting at high angles of attack at least as much as the replaced part of the wing. In order to obtain maximum benefit therefrom, it is desirable to increase the size of the wing chord at the fuselage as much as possible. This procedure and its consequences are especially interesting with respect to the influence of size increase on the characteristics of a Burnelli type airplane.

The body covering the powerplant installation represents the highest item of parasite resistance, and the endeavor is to reduce its frontal area as much as possible. Its width is determined by the required propeller diameter, and its height depends on the engine dimensions when above 2,000 horsepower and, when below that, upon the passenger headroom desired. Since the required propeller diameter increases only slightly with power addition and because engine and headroom considerations are also influenced slightly by increased power, a pronounced aerodynamic advantage by size increase is apparent.

This problem has been investigated in the following way (see also Table 1):

Two types of air-cooled and three types of water-cooled engines are assumed. The propeller diameter and the width of the engines determine the width of the fuselage. The maximum height of the fuselage is assumed to be five feet six inches, thus establishing the frontal area. The total weight of the plane is based on a power loading of 11 pounds per horsepower; the total lifting area which includes the lifting area of the body on a load of 16.5 pounds per square foot; and the span on an aspect ratio of seven. The wing will be tapered, the chord at the tip being one-third of the chord at the root.

The weight is computed as follows: The powerplant weighs 2.2 pounds per horsepower with the air-cooled arrangement, and 2.5 pounds per horsepower with the water-cooled. Landing gear is 5.5 per cent of gross weight, empennage 2.2 per cent. The weight of the wing group corresponds to the gross weight, load factor and span times a coefficient of .0042. The span applied is the span of both wings together and not the span overall, which latter would include the fuselage. This formula pertains to cantilever wings and not properly to braced wings which must be used at least on the large planes; otherwise the required thickness of the wing root would be very large and interfere with the cabin windows which could not be lowered as much as necessary without restricting the passenger vision.

The weight of the fuselage depends on its size or surface, its width and length, which is determined by the number of pas-

TABLE 1

Horsepower (H.P.)	2x400	2x500	2x500	2x750	2x1200
Propeller diameter (ft.)	9′	9′6″	9′6″	10′4″	11′6″
Engine width (in.)	50	54	26	30	36
Fuselage width (ft.)	13′2″	14′	11′8″	12′10″	14′6″
Frontal area (sq. ft.)	72	77	64	70	80
Gross Weight (lbs.)	8,800	11,000	11,000	16,500	26,400
Lifting area (sq. ft.)	533	667	667	1,000	1,600
Wing span (ft.)	61′	66′6″	68′6″	64′	106′
Lifting area of body (sq. ft)	156	187	144	212	308

sengers and the provisions for engine and tail wheel installation. The relation of 80 horsepower to 10 square feet of cabin area for each passenger is applied, and a weight of five pounds per square foot projected ground area.

The provision of 10 square feet of cabin area per passenger is 75 per cent higher than for an average passenger plane. Assuming a mean cabin height of 5 feet 3 inches, the cabin space is 52.5 cubic feet per passenger and .65 cubic feet per horsepower, which of course is also more than usual. The total design payload as derived later on is slightly more than 25 per cent of the gross weight, and yields a distributed load of 4.1 pounds per cubic foot of cabin space.

Figure 2 shows all these weight items in percentage of the gross weight. The decreasing weight of the fuselage does not balance the increase of the wing group for the bigger plane, resulting in a relatively increased structural weight. Despite that, the final result as to payload percentage (as given in Table 2) is in favor of the larger ships because of higher aerodynamic efficiency.

The required power at a speed of 125 miles per hour, as assumed cruising speed, is based on a drag coefficient of the body of k_x equals .0003; an airfoil drag coefficient of the wing of k_{xp} equals .000035; a parasite resistance coefficient for landing gear and empennage of k_x equals .00004 related to the total lifting area, while the induced drag is determined by weight, speed and span. The screw efficiency is assumed at 75 per cent, the unit fuel and oil consumption at .60 pound per horsepower-hour for the air-cooled engines, and .55 for the water-cooled, the range being 750 miles.

In Table 2 the weight of fuel and oil is termed in percentage of the gross weight and concludes the distribution of the disposable load. For crew and safety equipment four per cent is provided, the balance yielding the payload which, as mentioned before, is relatively higher and slightly in favor of the larger planes.

TABLE 2

Horsepower (H.P.)	2x400	2x500	2x500	2x750	2x1200
Power required at cruising (H.P.)	463	554	536	754	1145
Fuel consumption for 750 miles (lbs.)	1,670	2,000	1,770	2,485	2,775
Fuel in % of gross weight (%)	19	18.2	16.1	15.0	14.3
Weight empty (%)	52	52	54.2	54.9	55.3
Crew and safety equipment (%)	4	4	4	4	4
Payload (%)	25.0	25.8	25.7	26.1	26.4
Maximum speed (m.p.h.)	156	159	161	165	168

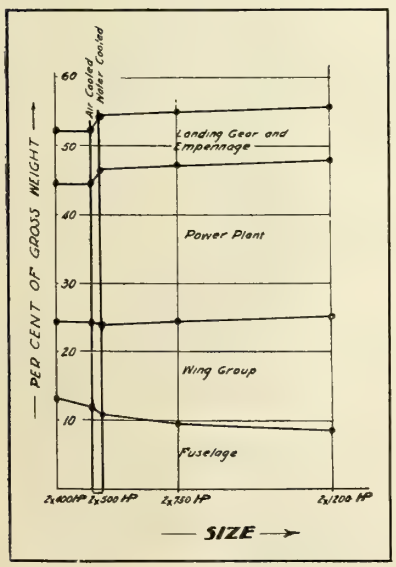


Fig. 2. Chart showing distribution of weight

Finally the top speed is derived under the same assumptions as made for the cruising speed. It improves with the size because of the reduced frontal area per horsepower of the body for the larger ships.

Table 2 contains the main results: It shows that the larger ship would have higher performance and that decrease of the fuel weight overbalances the unfavorable increase of the structural weight, and results in larger planes having greater payload percentage. This result is not based on the presumption that the weight expenditure for pilots and safety equipment is relatively lower for larger ships, this being the commonly used defense for the size increase of airplanes.

The attempt has been made to adapt the assumptions as closely as possible to the real technical conditions. Nevertheless it must be admitted that the figures represent the result of an abstract deduction and that they are subject to modifications in single applications. For instance, more detailed outlines of the smallest plane, the plane with two 400-horsepower radial engines, discloses that the cowling of engines with special adaptations can be modeled in such a way that the frontal area of the body is 10 square feet less than that resulting from the above calculation. Furthermore, the relatively large width of the body allows an arrangement of the wheels immediately beneath the lower edges of the body, which renders the axles free from bending moments, permitting the compression struts to be short, and yields convenient conditions for fairing the wheels. These and other features give the smaller type very efficient design possibilities.

The seaplane represents the type which is the most apt for incorporating the Burnelli design characteristics. A limiting factor in large seaplane design has been the difficulty of taking torsional loads through the wings, since the conventional fuselage is too narrow for direct attachment of float. The width of the Burnelli fuselage offers ideal conditions for float attachment with short struts and efficient angles. Thus, converting a landplane into a seaplane is as easy as with a present type small single-engine plane.

In all previous investigations the wide fuselage design has been compared to the nacelle type plane and no attention was paid to the single-engine plane. The performance of single-engine planes, however, is so superior to the conventional multi-engine plane that they are important factors in the field of air transportation. Recently a designer of extensive experience made the statement that the 600 - horsepower single-engined plane has the same payload and speed as the 900 - horsepower trimotor plane. He pointed to the successful conversion of the three-engined Junkers G.24 into the single-engined F.24. The superior performance of the

(*Continued on page 153*)

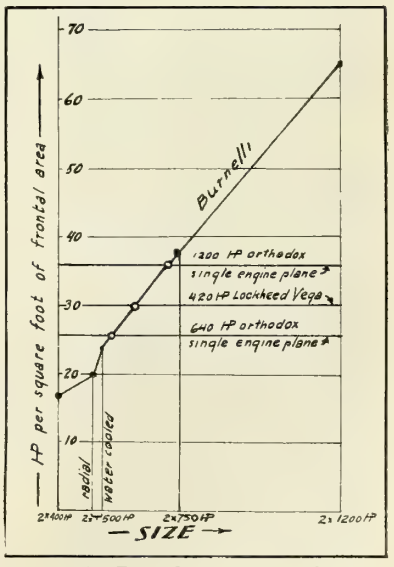


Fig. 3. Frontal area compared to horsepower

LIGHT PLANE COST PROBLEMS

Dwight Huntington

IN any beneficial discussion of light plane costs, the usefulness of these ships should be commented upon, for the salability of a product is dependent upon the proper balancing of utility and cost. Each must exist in proper proportion to the other if that product is to be a success commercially. If, therefore, we bear constantly in mind the fact that the light plane is essentially a pleasure vehicle and that the potential market is largely composed of young men and women whose financial status is limited—if not actually in doubt—we shall better appreciate the need for drastic cost reductions. Flowery exaggerations of utility will not sell many high priced pleasure planes.

Light plane costs may readily be divided into four groups: first cost; fixed overhead; operating; and maintenance. All are of great importance to both manufacturer and buyer, although the problems incident to their reduction belong almost entirely to the former. Balancing these costs against one another in a lengthy series of intelligent compromises—playing resistance and weight against cost—are designers' problems. For example, aerodynamic refinement is greatly to be desired from the standpoint of operating cost reduction; yet if obtained at the expense of tapered wings, a retractable undercarriage, or similar betterments, the first cost of the ship may prove to be the stumbling block for many prospective purchasers.

We may safely assume that the more popular light planes of the near future will be land types rather than flying boats, seaplanes or amphibions, because of the increased weight, power and cost of ships in the latter categories. Another assumption that appears reasonable is that the more popular planes will be two-seaters, by virtue of the chumminess of that model as compared with single-seaters, as well as the greater cost of larger models.

The disposable loads for these jobs therefore will be approximately as follows: two passengers, 340 pounds; baggage, 20 pounds; fuel, 10 gallons, 60 pounds; and oil, 4 quarts, 10 pounds; a total of 430 pounds. Net weights will probably exceed, or at least equal, the disposable loads, which means that gross weights of from 850 to 1,000 pounds are to be expected. The weights of individual jobs will depend upon a number of variables, such as amount of equipment carried, horsepower and general design arrangement.

Economy dictates low-powered engines, which fact presages power loadings of from 20 to 30 pounds per horsepower. Similarly, high power loadings call for light wing loadings, probably of four to six pounds per square foot, necessitating from 150 to 250 square feet of surface and precluding the possibility of dimunitive jobs.

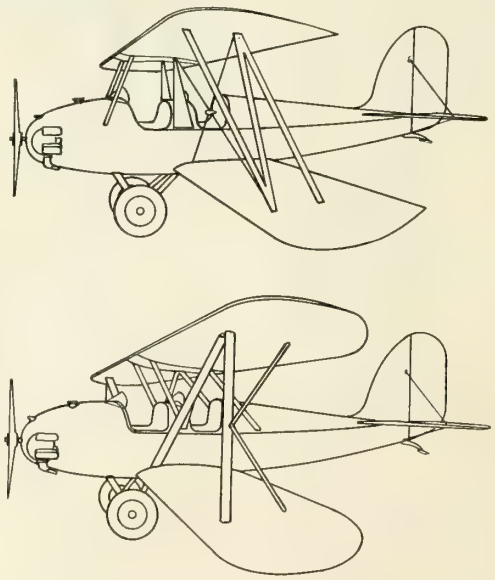
Another probability is that open jobs will continue in popularity, with designers working on suitable cockpit enclosures to take care of the general demand a few years hence. Whether tractor or pusher jobs dominate in sales will be determined to some extent by the manner in which manufacturers of the latter type are able to overcome pusher sales resistance, presumably by directing attention to the several advantages of that type, including a reduction in fire hazard.

Possibly the general design of light planes will continue, as at present, along the lines laid down by Louis Blériot, twenty odd years ago. Perhaps we shall witness a reversion to the tandem or the canard types, or we may see a dusting off of the Dunne design—headless and tailless—thereby saving much of the weight and expense of a fuselage. Yet it must be acknowledged that, old as these latter general schemes are, the first two antedating successful flight, all remain nevertheless in the experimental stage, relatively speaking. For this reason, although there's no predicting what distant years hold in store, we may conclude that the light planes of the immediate future will follow along conventional lines with numerous improvements in detail, particularly those favoring machine production methods.

The relative merits of monoplane, biplane and triplane need no elaboration here, but one comparison may be advantageous as indicating the probable influence of cost in the choice of types. Assuming that three ships—one of each type—have quite similar powerplants, equipment, fuselages, undercarriages, empennage and controls, and that each has a center section, we find that the monoplane requires two wing panels, the biplane four and the triplane six. Admittedly the triplane would excel the others in compactness and would require less material. On the other hand, the multiplicity of parts would entail increased labor costs and make it, in all probability, the most expensive type to produce.

The slight advantage possessed by the monoplane with its smaller number of parts may be compensated for by the small saving in material in the more compact biplane. So let us examine the general design of these two types as being the ones we shall continue to see the most of during the next few years.

Preferences for either cantilever or externally braced wings present two principal problems, in manufacturing and in housing costs. Granting that the untapered cantilever wing may be produced as economically as externally braced panels, there remains the question of a satisfactory folding wing arrangement. This necessary feature appears more easily attainable, in a practical way, with the latter type of construction. In the increased aerodynamic efficiency of the tapered cantilever wing, however, designers will continue to find incentive for developing cheaper production methods.

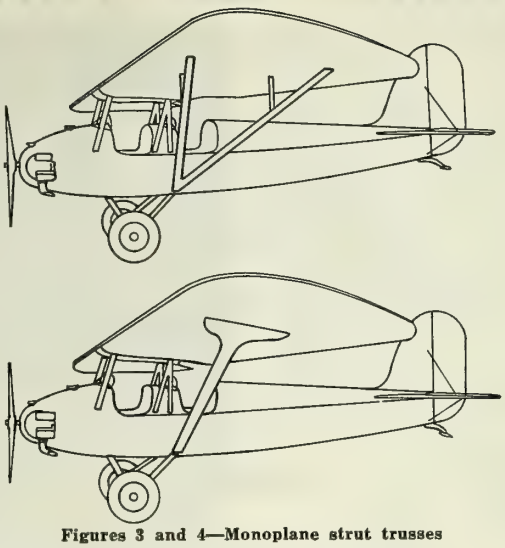


Figures 1 and 2—Biplane trussing systems

In all types the minimum amount of external bracing is desirable not only from the standpoints of resistance and weight, but also because of the fact that the stresses will be so small that the design of the bracing members must be governed by practical considerations of handling rather than by column loads.

Let us consider a few general designs that are at once practical and economical in manufacture and in maintenance.

Taking the single-bay biplane as a first example, we may speedily conclude that the conventional double-lift-trussed cell is uneconomical in structures so lightly stressed, being inferior to the single-trussed type. In the latter style of architecture, the cellular torsion at the interplane strut point is resisted entirely by the internal drag trusses of the panels.



Figures 3 and 4—Monoplane strut trusses

The most commonly used truss of this type is that originated by Col. V. E. Clark, and shown in Figure 1. Single lift and landing wires only are necessary, in conjunction with the usual N-strut and a reduction in cellular torsion is one of the advantages found in staggering the planes. As a general rule, however, the front and rear struts of the N will be lightly loaded and a more suitable I-strut is worthy of consideration on light jobs.

Figure 2 shows the K-bar truss originated by J. V. Martin and which, like the Clark, is more than a decade old. Here again single lift and landing wires were used, although a single lift strut, substituted in the drawing, has advantages in simplicity, safety and cost. In the Martin truss the K-strut is well stressed and should prove more economical than an N-strut. The principle of the design rests of course in placing vertical strut by means of the lower rear one and equalizing it by another horizontal component rearward induced by the upper rear strut. The vertical components of both rear struts thereby go into the vertical or front strut.

The Martin truss was developed for use in conjunction with airfoils having a very small pressure travel, equipped with wing tip ailerons and no stagger was employed. Yet no good reason exists that this truss is not adaptable to other airfoils, equipped with conventional ailerons, providing the increased torsion is designed for. Certainly it is deserving of more consideration on the part of light plane designers than it has thus far enjoyed.

Turning to the monoplane type, we find that the parasol arrangement affords the most economical truss as well as excellent vision where most needed. The conventional manner of bracing a two-spar wing with a V-strut is shown in Figure 3, this arrangement possessing advantages in folding, accessibility and visibility over parallel strut bracing. Here again, however, it will be found that the struts are not loaded in proper relation to their length, which makes for inefficiency.

Figure 4 shows a more economical arrangement that we are to see much of in the next few years. The use of a T lift strut has many advantages in cost, weight, resistance, visibility and accessibility, over the V-strut of Figure 3. In locating the stem member of the T, the position of the center of pressure in all conditions of attack is important and particularly its position in inverted flight. By means of the cross member, the pressure travel will induce bending in the stem and, although about the minor axis of the strut, every effort should be made to hold the maximum bending stress to the lowest figure possible. Particular attention should also be paid to the drag truss in order to secure the utmost in torsional rigidity.

In passing the subject of general design it may be well to emphasize the fact that, from the manufacturing point of view, all changes are inefficient and denote a lack of foresight. Sound design is a part of sound business. So many airplane manufacturers have sought the wailing wall as the result of an unwise initial choice of models, or of general designs, that it is high time proper attention was paid to these important considerations.

Detail design, likewise, has a direct and important bearing on the cost problem, and strenuous efforts must be made to obtain the utmost simplification of each of the seven requisite units and their component parts.

In powerplants we may expect to witness further development of air-cooled engines of very low cost construction and somewhat heavier per horsepower. Probably they will largely be of the L-head type with integral lubricating and single ignition systems. Considerations of both engine and propeller efficiencies point to the rapid development of geared engines.

Furnishings and equipment will be reduced to the requisite minimum on standard jobs. Probably the three engine instruments and an altimeter will suffice. Rigid economy dictates that all expensive accessories be dispensed with, yet farsighted designers will include these in their design calculations so that any or all may easily be added at the behest of affluent purchasers.

In the five structural units the trend probably will be in the direction of fewer and larger members. For the present, fuselages of rectangular, trapezoidal or triangular sections, of welded steel tube, cloth covered, seem to offer the greatest economies, but aluminum alloy monocoque construction undoubtedly is on the way.

Wing detail construction may be cheapened by the adoption of identical spars of simple construction, a rigid Warren drag truss and stamped ribs and fittings.

Undercarriages are apt to remain rubber-sprung for obvious reasons. There is at this time, however, a real need for a series of lighter and cheaper wheels and tires, designed for working loads of from 400 to 600 pounds and ranging from 20 to 24 inches in diameters. Since the momentum in landing will be small, wheel brakes are unnecessary, although they will be widely used as soon as they become available at reasonable prices. Empennage and control members will (*Continued on page* 144)

OUR READERS AIR THEIR VIEWS

Earle Ovington, Early Bird, sets a five-fold task for airplane designers:

"Your editorial in AERO DIGEST for December, 1930, leads me to send you some thoughts on what I consider the *immediate* objectives of designers of airplanes and engines.

"First: Variable pitch and reversible pitch propellers. The former is the more necessary of the two. Rapid take-off and rapid climb are very desirable and the variable pitch prop would give both of these to us.

"Second: A wing the characteristics of which could be altered in the air so as to get a high lift for landing and take-off, and a fast airfoil for economical cruising and good top speed.

"Third: Retractable landing gear. It is nothing short of criminal to have to waste engine power pulling the landing gear through the air when it is only needed on the ground. An airplane is supposed to be a *flying* machine, not an automobile.

"Fourth: A rugged, absolutely dependable Diesel engine, preferably operating on the two-cycle principle. The four-cycle Diesel is, of course, an advance over the type of engine used, but valves are a great drawback both as to dependability and as to servicing.

"Fifth: The practical 'flying wing.' Its advantages are too well known to need further comment.

"I have not named one improvement which is beyond present-day designers. And now, while aviation is in the doldrums and engineers have time to give to these matters, is the time to tackle the jobs.

" 'Eventually, why not now!' "

Night passenger service and a high speed transcontinental air mail are Victor M. Ostrom's suggestions to transport operators:

"I offer one suggestion that may be put into practice almost immediately. Between such points as Chicago and New York, Los Angeles and Kansas City, San Francisco and Seattle, New York and Miami, 'sleeper' plane service should be established, using planes such as the Fokker thirty-place, which is convertible into a sixteen-berth ship. By cutting twenty-four to forty-eight-hour train trips to overnight plane trips, transport companies will enable the traveler to retire at nine in the evening and arrive at his destination in the morning after a refreshing sleep, having avoided in the journey as much as two days and two nights of train travel. In trips of more than twelve hours of plane travel, the passenger could make convenient connections the next morning to complete his trip; and in this way arrive at a destination as far away as 2,000 miles with only a few hours of fatiguing daylight travel. The practicability of such a project at the present time can be readily seen, when operated with large low-cost-per-mile planes. Even though a double fare were charged, the service would undoubtedly be well patronized.

"A present need, which has been stressed by Frank M. Hawks, is a transcontinental airline using small fast planes such as the Travel Air Mystery plane to carry mail across the country in twelve hours. Even with a charge of forty or fifty cents for a half ounce letter, a large amount of mail would be given for carriage by plane, as this service would take the place of telegraphic messages, costing $1.35 and up, which many firms send nightly. Such a line would certainly be successful from a business standpoint and would render a very great service to business firms in New York, San Francisco, Los Angeles and other terminal points."

Glenn V. Bolt made pertinent inquiry regarding the licensing of home-built planes and the status of time secured on such craft. The Department of Commerce made the following comprehensive reply:

"With reference to a home-made airplane built from factory plans and parts, the Department has just received a similar inquiry from a manufacturer, and the decision was that the manufacturer of the airplane would have to submit the necessary data, also an airplane of that design for engineering test, which if approved would be issued an Approved Type Certificate.

"The manufacturer, upon selling the plans and parts to an individual, would then be required to submit a sworn affidavit that such drawings and parts conformed with the original specifications filed with the Department for which the Approved Type Certificate was issued. The purchaser of these materials and drawings, upon the completion of the airplane, would then submit a sworn affidavit to the Department to the effect that the airplane had been constructed in exact accordance with the drawings and specifications. He would then be required to submit the airplane for an inspection and engineering flight test. This being satisfactorily accomplished, the plane would be eligible for commercial license.

"Solo flying time secured in a plane constructed such as outlined above may be counted in applying for any class of pilot's license. In fact, solo flying time, whether obtained in licensed or identified aircraft, may be credited."

Karl Ort protests against the pointless regulations passed by some states:

"I was very much interested in reading 'The Flying Dollars of Kansas' by Ernest Jones in a recent issue of AERO DIGEST, in which he tabulated the number of airplanes in the various states.

"It is my contention that state (and Federal) laws have done much to restrict the ownership of airplanes. In fact, in some cases people who have been flying for many years have given it up in disgust because of the useless, senseless and restricting regulations passed by some of our states.

"If Mr. Jones would make a study of airplane ownership and registration as influenced by legislation in the various states, he might reach some very interesting conclusions. That is to say, they would be interesting to those of us who manufacture and sell airplanes and supplies."

K. W. H. prescribes his specifications for the private pilot's perfect plane:

"I think Don Rose's December article about hits the nail on the head. Commercial flying is hitting its stride now under present conditions, and private flying is crowded out of the picture. I believe that it would be better for the industry and the public both if private flying were encouraged to take the lead.

"Manufacturers have been finding it slow to sell to the general public. Why? I, and a lot of other young men who frequent the flying fields, think that you manufacturers have tried to sell us what you have and at your price instead of what we (Tom, Dick and Harry) want and need for a price a young fellow can pay.

"Here is the plane for the 'Tom, Dick and Harry's' over the country. It should be designed for: first, safety; second, economy; and third, utility to the amateur pilot. Type: monoplane, either semi-cantilever high wing or full cantilever center wing. Capacity: two place, probably tandem, open cockpit with but one instrument board. Landing speed: twenty-five miles per hour in a calm, loaded. Climb at a very steep flight path and I don't mean a zoom. The rate of climb is of less importance. The above characteristic would also give very short landing and take-off runs.

Any good reliable air-cooled motor of about eighty horsepower. Propeller pitch set for take-off rather than cruising advantages. Very wide Airwheel landing gear with long-travel Aerol struts. Height: not over six and a half feet. Top speed: around eighty miles per hour. Ship streamlined better than most. Spin-proof. Nearly whipstall-proof but able to mush under good control due to very thick wing curve and extra-size control surface. Construction: standard but simple. Crash pads. Wing span: about thirty feet. Possibly permanent built-in slots or flaps. Wing loading: not too light, although the danger from gusts can be overcome by low power loading and the large controls. Weight: around 1,250 pounds. Should be strong enough to stunt violently but ship does not have to be a 'born stunter.'

"The safety of flying most ships is dependent upon about thirty per cent plane and seventy per cent pilot. This new ship should have flying and landing characteristics so as to make it the other way around."

QUICK STOPS MAY SAVE YOUR SHIP!

Every pilot knows he can't always pick his landing conditions. Mud, sand, plowed ground, or a 2 by 4 landing field can look mighty good when gas is low and the ceiling is lower. And they look a lot better when you know you will land on Airwheels with the new roller-bearing brakes.

These big, soft rolling pillows bring you down safely on ground that would put a plane on its nose if it had any other wheel and tire equipment. They make cross wind and down wind landings with perfect control.

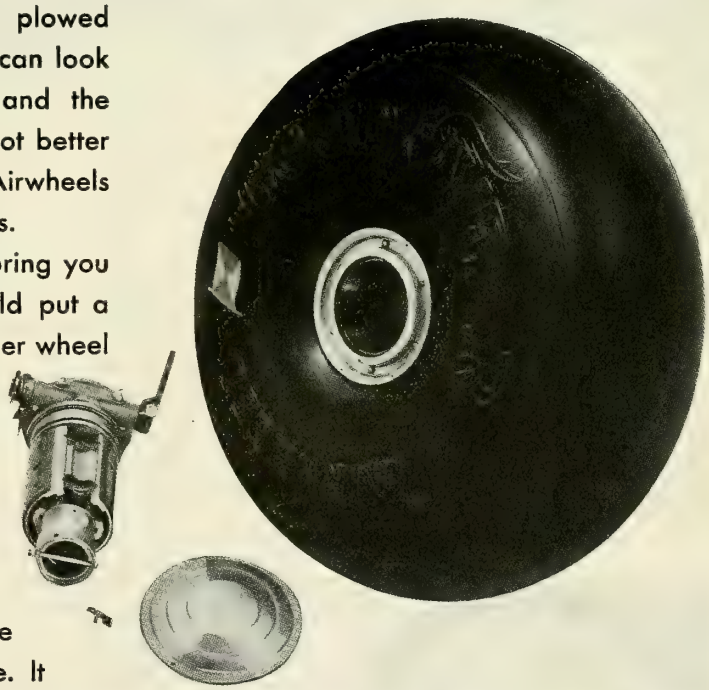
Then the new Airwheel brake goes into action and the ship comes to a sure, smooth STOP.

There's never been anything like this brake on an airplane before. It has *power—smoothness—certain release.*

With this new Goodyear brake you can either slide the wheels or bring up the tail, depending on the landing surface, *and still keep complete control.* Its release is as sure as its braking action — its power will hold the plane at a standstill with full throttle — and *stop it again* when you let it roll.

You may not need such a brake for ordinary landings — but when you need it you need it bad.

For full engineering data, write or wire Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.



WHEN YOU BUY A NEW SHIP SPECIFY GOODYEAR AIRWHEELS

GOODYEAR

EVERYTHING IN RUBBER FOR THE AIRPLANE

CALCULATING INSTRUMENT FOR AERIAL NAVIGATION

MECHANICAL mathematics for the navigator, designed to speed up the process of correcting compass error and determining the true course, has met with success, after years of experimental work, in the perfection by Vernon Everett, Fullerton, Calif., aeronautical engineer, of a new type of navigation instrument.

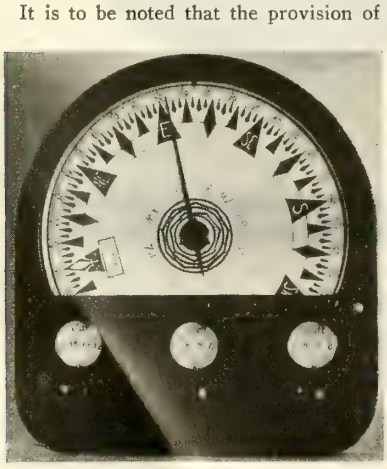
Designed and constructed as a type of calculator, the instrument is expected to prove of exceptional benefit to navigators of airplanes, although equally useful for marine navigating officers.

The navigation instrument, of simple rugged and compact construction, provides a system by which known compass errors, such as variation, deviation and drift, can be compensated for by adjustment of the instrument. The instrument will then indicate the actual compass course to be followed to traverse a predetermined true course.

The instrument consists of a large dial, at the periphery of which a scale, graduated and numbered in the manner of a compass dial in degrees from 0 to 360, is formed. Any of these graduations is adapted to be aligned with an index pointer to indicate various courses. The index pointer is fixed to the outer edge of the frame and is visible, along with the upper portion of the dial and the hand indicating the compass course, through a glass panel.

In conjunction with the scale showing the points of the compass, the dial also is marked with a scale graduated and numbered to indicate degrees of east and west deviation in accordance with predetermined compass errors caused by some local attraction within the craft on which the instrument is used.

It is to be noted that the provision of the deviation scale on the dial dispenses with the separate deviation chart, which is usually prepared for each craft.



Dial of the navigation instrument designed by Vernon Everett of California

Below the large, or main dial, are three smaller dials. The first is graduated and numbered in degrees of east and west variation, the second in degrees of east and west deviation, and the third in degrees of east and west drift.

A portion of each dial is visible through a magnifying glass panel. By means of knobs, the dials can be rotated for the graduations to co-act with fixed pointers within the openings in indicating predetermined compass errors. To distinguish east and west variation, deviation or drift indications on the respective dials, the east portion of each dialing is indicated by three parallel lines representing the three fingers of the letter E. A zigzag line, representing a continuous W, marks the west.

How the Instrument Is Used

The use of the instrument is as follows:

Let it be assumed that the predetermined true course is 318 degrees, that the known variation is 16 degrees and the drift nine degrees east. The large dial is rotated until the 318 graduation is aligned with index pointer so as to indicate the true course.

It will be noted that with the variation, deviation and drift dials adjusted to indicate no error, or zero, the hand indicating the compass course will be aligned with the index pointer and hence with the 318 degree graduation of the large dial.

The variation dial is now adjusted to indicate the 16 degrees east variation, which movement will retard the hand to indicate on the scale a subtracted 16 degrees, so as to show a compass course of 302 degrees. The drift dial is now adjusted to indicate the nine degrees east drift and further retards the hand a subtracted nine degrees, so as to point a compass course of 293 degrees.

The hand is provided with a relatively short leg diametrically opposed to the pointer indicating the compass course. This short leg, which traverses the scale showing deviation is noted and found to be four degrees west. The deviation dial is adjusted accordingly, which advances the hand an added four degrees. An actual compass course of 297 degrees is then indicated in order to travel a predetermined true course of 318 degrees.

If it is desired to change the course, such as is done in great circle flying, it is necessary only to adjust the dial indicating the course so that the desired course is shown by the index pointer. The hand now points to the new compass course. If any of the compass errors, such as drift, should change during flight it is necessary only to adjust the drift dial to the known drift and the new compass course will be indicated by the hand.

The new instrument is the product of the Everett Instrument Company, Fullerton, Calif.

Airplane Shocks Indicated by New Electrical Device

TESTS of an experimental device designed to enable engineers to estimate directly the amount of shock on various parts of an airplane while taking off, in flight or landing, have been conducted with successful results by the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. Ordinarily, the amount of shock on parts of an airplane in operation is determined indirectly by mathematical calculations after tests of a model in a wind tunnel.

The device, known as the "electric pulse," is attached to the part of an airplane under observation, or to as many parts desired if a number of these instruments is used, and connected to an indicating mechanism installed in the cockpit or cabin.

The electric pulse consists of an aluminum casting and two weights which are free to move up and down independently in two vertical channels. A spring is placed under each weight. This spring can be regulated to a given intensity of shock resulting from bumpy air currents while in flight or from contact with the ground when taking off or landing. When this shock occurs, one of the weights is forced away from the top and opens an electrical contact. The indicating mechanism consists of a box containing batteries and six Knoles Grid-Glow tubes which light whenever this electrical contact is broken.

In tests conducted by the Westinghouse company, the electric pulse was attached to the tips of the wings of a plane which was flown to an altitude of 5,000 feet. As the plane struck "bumps" in the air currents, the amount of shock was registered by the device. When the electric pulse was attached to the landing gear, the amount of shock of different landings at different speeds on hard and soft portions of the field was indicated.

The device was developed by J. Ormondroyd and D. D. Knowles of the Westinghouse Research Laboratories and W. A. Brecht of the engineering division.

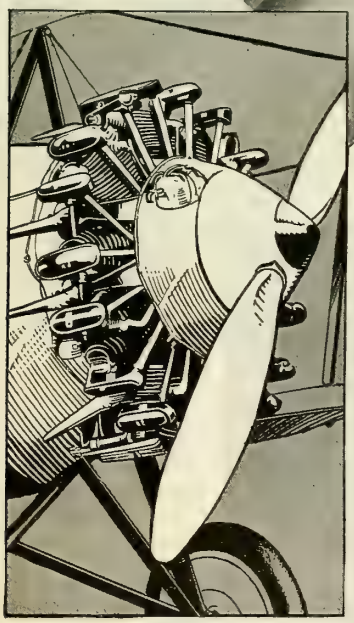
The electric pulse may be used on lighter-than-air craft as well as heavier-than-air craft to determine the amount of shock encountered under various conditions of flight.

CHART RECORDING INSTRUMENTS

A NEW line of circular chart recording instruments, including voltmeters and ammeters and identified as Type A, has been developed by the Westinghouse Electric and Manufacturing Company, Newark, New Jersey.



SAVE THE ROCKER-ARMS



Effective, dependable lubrication is here most important. Until Texaco Marfak Grease came into general distribution, now available at the principal airports, it was a troublesome problem.

Texaco Marfak Grease is especially suited for the lubrication of rocker-arm assemblies and all enclosed grease-packed bearings.

It is peculiarly resistant to heat, clings to the bearing surfaces and retains its excellent lubricating qualities for long periods of service. It is strongly recommended, both by engine manufacturers and by aviators who have tried it.

Texaco Marfak Grease and the famous Texaco Airplane Oils and Texaco Aviation Gasoline are recognized everywhere for their high quality and uniformity. There is a Texaco Petroleum Product for every aviation need.

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THE TEXAS COMPANY, 135 East 42nd Street, New York City

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TEXACO AIRPLANE OILS
TEXACO AVIATION GASOLINE
TEXACO MARFAK GREASE

PENNIES AND PENNY-WEIGHTS

By

E. J. W. Ragsdale

Research Engineer
Edward G. Budd Mfg. Co.

THE aeronautical industry, emerging from the uncertainties of a design period, finds itself confronted by problems of production. It borrows a leaf from automotive practice and wonders why the gospel is so unclear. It hires a production expert from the sister craft only to find his solution too elaborate for immediate use.

The tools of big production are expensive; they are justifiable only by assured big production. The relation of their value to that of salable products is definite and indisputable. No such economic relation now obtains in aviation, even granting the industry's most optimistic figures.

The industry really enters the most critical period of its history. In the past, its commercial failures, however tragic, have been, at the most, personal. Today, financial interest is widespread. Money has been perhaps too readily obtainable. There is a temptation to splurge on equipment, though certainty of production is lacking. The curve of aircraft sales has established too few points to make reasonable prediction possible. Even the trade demand has not been accurately sensed. A hundred models, or more, now seek to feel it out.

Responsible companies recognize this and hesitate to commit themselves for tool equipment, though they know full well the price of being unprepared. It is almost a case of losing your shirt if you do, but lacking even the price of a shirt if you don't.

Tooling up for big production is the easiest thing in the world, if only the production is assured. Tooling up for a possible production of some possible model is an entirely different matter. Yet, upon the successful solution of this problem rests the fate of many an aircraft company of today. The solution is far from being an easy one.

The difference between craftsmanship and mass-production is tools. There is no logical "in-between" and yet that is where the industry finds itself. Each concern must determine for itself what percentage tools, what percentage hand work. In doing this, some figure of production must be assured; for this is the sole basis of any cost analysis. With this figure, a reasonable machine-tool layout can be made.

But in this connection it is well to bear in mind that "brains are cheaper than tools." Any dub can use a Sears-Roebuck catalogue. It takes an able staff to prepare a worth-while analysis, but that staff will more than save its hire.

First consideration must be given to flexibility of equipment. Few aircraft companies are in a position to use standardized single-purpose machines. Analysis will determine the equipment most economically suited in each case.

For instance, take a simple ferrule such as tips a walking stick. A metal craftsman, with the tools of his kit, could make one in two hours. The cost would be three dollars, including a job-shop overhead of fifty per cent.

If a dozen were to be made, the craftsman would spend three hours in improvising special tools and an hour and a half in making the twelve ferrules. Allowing forty-five cents for tool materials, this five dollars spent in preparing special equipment will have reduced the price to sixty cents per ferrule and will have effected a saving of twenty-nine dollars.

With an order for a thousand, a die-maker would be given the job of making some simple dies for use on an arbor press. The apprentice boy wields the Archimedean lever for a day and the cost per ferrule will have been reduced to eight cents—even after having digested a die cost of seventy-five dollars.

This is the best that the jobbing shop can do and, if you were buying ferrules in quantity, this best would be far from good enough.

The next step is to approach a plant equipped to do small stampings and place an order for 10,000. The dies will cost some $250, but in spite of this initial layout the price per ferrule will have fallen to three cents. Subsequent orders, when the die cost will have been absorbed, will show a reduction to one-half cent.

Then follows single-purpose machinery with a unit output of 30,000 pieces per day. The price reduces to .05 cents —a saving of $4,500 on the first million ferrules. It pays for machines and fixtures. But, there are not many ferrules on an airplane, today.

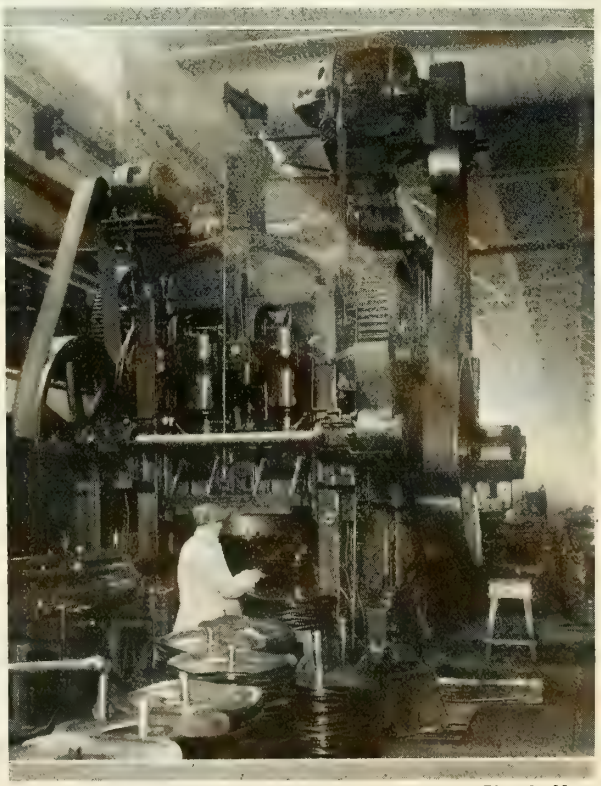


Photo by Murry

Machine in plant of Budd Wheel Co. for production of disc wheels

Here and there aviation finds itself extended beyond the limits of its jobbing shop practice. Its problem is whether or not to put work in outside specialized shops or to equip its own plant to do the work. Normally the first alternative offers less grief and better economy. This is especially true where anticipated production may eventually warrant the use of single-purpose machinery, such as characterizes automobile manufacture.

Letting out work requires discretion. One naturally hates to yield complete supervision, and there is also the danger that an outside shop may lack appreciation of the fine points peculiar to one's own craft. This is, perhaps, the reason why the automotive companies have not been more helpful in aircraft development. The one outstanding exception has been successful because the company segregated its air unit.

Merely thinking of aviation does not make one "air-minded." It is the exceptional rather than the usual

(*Continued on page* 118)

PROVEN PERFORMANCE PROVEN ACCEPTANCE...



Now the 1931 GREAT LAKES SPORT-TRAINER *... finer than ever!*

The perfection of the 1931 Great Lakes Sport-Trainer is a triumph of careful engineering and standardized manufacture. The Sport-Trainer, produced by a manufacturer of proven stability, has for a background a brilliant record of achievement in performance, in reliability, in demonstrated acceptance. Its engineering features have brought forth the enthusiastic endorsement of scores of unbiased experts — its economy of operation has become a standard of comparison throughout the industry. Constant refinements have given this finer Sport-Trainer an even greater degree of ruggedness, of speed, of maneuverability. At $3150 (flyaway, Cleveland) the 1931 Great Lakes Sport-Trainer maintains its envied position as the outstanding value in all aviation.

Manufactured under U. S. Department of Commerce Approved Type Certificate No. 228

GREAT LAKES AIRCRAFT
CORPORATION CLEVELAND
Contractors to the United States Army and Navy

DIGEST OF FOREIGN TECHNICAL ARTICLES

By Elsa Gardner

TAKE-OFF MEASUREMENTS

The Attempted Take-Off of the "City of Tacoma" for the Trans-Pacific Flight at Kasumigaura, Japan, T. Ogawa. Tokio Imperial University—Aeronautical Research Institute—Report No. 63, October, 1930, Vol. 5, No. 10, pp. 245-259, 6 figs.

THE motion and attitude of the *City of Tacoma* during the unsuccessful start for the Trans-Pacific flight on August 30, 1930, were measured photogrammetrically. The limit of overloading for the plane was calculated by the author's own method from the measured climb velocity during fuel discharge and found to be about 4,500 kilograms.

Fuel was discharged through emergency valves 89 seconds after the start, the distance of 1,557 meters of the total runway of 1,900 meters having been run, and the velocity of 125 kilometers per hour having been attained. With this velocity the unstick would have been possible if the lift coefficient of the wing had been over 1.42. Since the airplane actually took off the ground in only 0.6 seconds after the commencement of the discharge, the lift coefficient might well be assumed very close to this value.

Time, distance and height as read from the films and the velocities calculated from them are given in tables. Back, front and side views of the running airplane were taken with three cameras of which specifications are given.

WHEEL STRESSES

The Stresses in a Radially Spoked Wire Wheel under Loads Applied to the Rim—Part II.—Simplified Formulae and Curves, A. J. Sutton-Pippard and W. E. Francis, (British) Aeronautical Research Committee—Reports and Memoranda No. 1337 (Ae. 468), July, 1930, 10 pp. and 11 figs.

FORMULAE for use in the calculation of spoke loads and rim reactions in radially spoked wire wheels, which were developed in connection with the investigation described in Reports and Memoranda No. 1302 (Ac. 445) (abstracted in November issue of AERO DIGEST) are given in the present report. These formulas are based on the assumption of a large number of spokes, but it was shown that reasonable accuracy was obtained with a number as low as twenty-four.

The simplified formulas and curves plotted from them are presented in a form suitable for design purposes and for further investigations.

WING RADIATOR TESTS

Wind Tunnell Experiments on Steam Condensing Radiators, R. G. Harris, L. E. Caygill, and R. A. Fairthorne. (British) Aeronautical Research Committee—Reports and Memoranda No. 1326 (E. 37), June, 1930, 28 pp., 17 figs.

A FURTHER development of the radiator experiments carried out in the Royal Aeronautical Establishment since 1922 is reported. In regard to honeycomb radiators, it was concluded that steam cooling decreased the heat dissipation about 4 per cent at 60 m.p.h. and the weight about 37 per cent for the above tubes, and thus where weight is important would improve the performance.

For wing radiators, by using the most efficient portion of the wing a high heat dissipation has been obtained, the cooling per unit surface being about 60 per cent greater than that of a wing radiator occupying the whole surface. The radiator was satisfactory in use; it gave no trouble in starting and the drainage was satisfactory down to O degree dihedral. The radiator continued to work indefinitely even at a slight negative dihedral, but with reduced efficiency of cooling. This radiator was found to deal with all the heat dissipation required on the Bristol fighter and Fairey Fox planes.

PROPELLER TESTS

Full Scale Experiments on High Tip Speed Airscrews. The Effect of Thickness of Section on Airscrew Performance, W. G. Jennings and A. Ormerod. (British) Aeronautical Research Committee—Reports and Memoranda No. 1339 (Ae. 471), August, 1930, 6 pp., 8 figs.

THE investigation of the effect of high tip speeds on propeller performance is continued from Reports and Memoranda Nos. 1173 and 1282. Performance tests of three conventional section propellers with mean thickness-chord ratios of 0.10, 0.08 and 0.06, respectively, were carried out in a single-seater plane, the first two propellers being tested at various pitch settings of the blades. Results were compared with wind-tunnel tests on similar propellers at low and high tip speeds.

The 0.10 thick propeller showed a serious drop in efficiency when the tip speed exceeded the velocity of sound, and for a pitch-diameter ratio of 0.56 this decrease in efficiency was 20 per cent. The 0.08 and 0.06 thick propellers both showed a decrease of about half this amount. A direct comparison of the 0.10 thick propeller with a high-speed model propeller of similar thickness appeared to indicate that there was no serious scale effect on the maximum efficiency or torque coefficient.

MULTI-ENGINED PLANES

Safety and Multi-Engined Machines, W. L. Cowley. "Aircraft Engineering," Vol. 3, No. 23, January, 1931, pp. 299, 304.

THE effects of dividing the power of an airplane into several units are discussed along mathematical lines, and the question of which factor is the more important, namely the increase in the probability of failure, or the ability to fly level with an engine out of action, is taken up. The reliability and height factors and the index of failure are derived. The author explains the value of multiplying the power units in a machine and contends that while this means may decrease the reliability of a service, a great increase in safety apparently results. In the case of a two-engined plane fitted with the same type of engine as a single-engined plane and capable of maintaining horizontal flight on one engine, the reliability for safe flight may be greater than that of the single-engined plane by as much as one failure in 50,000 instead of one in 100.

LUBRICATING OIL RESEARCH

The Action of Antioxygens in the Oxidation of Unsaturated Fatty Oils—Part II, B. Yamaguichi. Tokio Imperial University—Aeronautical Research Institute—Report No. 65, Vol. 5, No. 12, November, 1930, pp. 287-305, 5 figs.

AS a continuation to the previous communication (Report No. 61 abstracted in the September issue of AERO DIGEST), the results of investigations on the antioxygenic action of diphenylamine, diphenylguanidine, and hydroquinone in the oxidation of olive oil are described. The results of the experiment can well be explained by the theory of mechanism of the inhibition which had been developed in the earlier paper. A modified equation has been established in order to calculate the form of the velocity curve for the oxidation of the oil containing diphenylamine, the equation agreeing with the actual results of experiments.

Diphenylamine, acting as a good antioxygen, lowers the initial rate of oxidation in a remarkable degree although it does not inhibit the oxidation as completely as unsymmetrical diphenylhydrazine does. Hydroquinone acts as a very strong inhibitor, prolonging the induction period in a remarkable degree as unsymmetrical diphenylhydrazine does. The antioxygenic power of diphenylguanidine is superior to that of diphenylamine but inferior to that of hydroquinone.

CORROSION PREVENTION OF METALS

A Few Innovations in the Study of Corrosion and in the Protection of the Surfaces of Metal Products Against Corrosion (Quelques nouveautés dans l'étude de la corrosion et dans les protections de surface des produits métallurgiques contre la corrosion), J. Cournot. "Technique Aéronautique," Vol. 21, Nos. 109 and 110, November and December, 1930, pp. 269-273 and 282-293.

IN the first installment of the article the author, a professor at the French national aeronautical college, discusses the theory of corrosion and methods for studying it. In the second part he takes up means for protection against corrosion, emphasizing electrochemical protection and protection of the surface, which he investigated at the Laboratoire de Metallurgie du Conservatoire National des Arts et Métiers. The new methods of pickling, case hardening, plating, triple casting, and spraying with compressed air holding fine liquid particles of the metal to be deposited are described. Electroplating with copper, zinc, cobalt, nickel, cadmium, and chromium are outlined and reference is made to non-metallic coating, and to the anodic process for the protection of aluminum and duralumuin.

AIRPLANE TAIL BUFFETING

Technical Report by the Accidents Investigation Sub-Committee on the Accident to the Aeroplane G-AAZK at Meopham, Kent, on 21st July, 1930. (British) Aeronautical Research Committee—Reports and Memoranda No. 1360, January, 1931, 92 pp., 28 figs.

THIS report is of general interest principally because it concludes that the cause of the accident investigated was primarily due to a phenomenon to which the name of buffeting is given, and suggests a sequence of events. This term denotes an

(Continued on following page)



BELOW: *Oakland, California, U. S. Airways Radio Station, Department of Commerce.*

SAFEGUARDING THE NATION'S AIRWAYS WITH UP-TO-THE-MINUTE WEATHER INFORMATION FLASHED BY

TELETYPEWRITER SERVICE

ONE of the important duties of the Airways Division of the United States Department of Commerce is to furnish air transport interests with complete information as to weather conditions along the routes they are flying. To this end, weather reporting stations are maintained throughout the country by the U. S. Weather Bureau, in co-operation with the Department of Commerce. Messages between the stations are exchanged instantly and accurately by Teletypewriter Service.

Some seventeen circuits are used to connect these weather reporting stations. Every hour the weather observer at a terminus of each circuit types out a report of meteorological conditions in his vicinity. This report is identically reproduced at the same moment in each station along that circuit. As the first report is concluded, the next observer types his data and so on until the last one has reported.

In this way weather conditions along the airways are made known to pilots before they take off for distant airports. This information, so essential in air navigation, is also broadcast to planes in flight by the Airways Radio Stations of the Department of Commerce. Even the most remote and isolated stations along the routes, situated on mountain tops or in desert areas, are continuously in touch one with another, just as though "under one roof."

Commercial organizations also find Teletypewriters valuable for co-ordinating the activities of separated offices. Your local Bell Telephone Company will be glad to discuss with you how this modern communication aid can be of service to your company.

AMERICAN TELEPHONE & TELEGRAPH CO. AND ASSOCIATED COMPANIES
BELL SYSTEM

(*Continued from preceding page*)
irregular oscillation of the tail unit, in which the tailplane bends rapidly up and down and the elevators move in an erratic manner, and this phenomenon is distinct from that known as flutter. Buffeting is due to eddies from the main planes and is known to occur on some low-wing monoplanes when the aircraft approaches the stalling attitude.

The plane, which was a low-wing Junkers monoplane, was seen to enter a cloud and immediately a loud noise was heard and fragments of the plane were observed falling from the cloud. Experiments at the National Physical Laboratory have shown that tail buffeting of a model of the G-AAZK occurred at angles of incidence near to stalling and that the violence of the oscillations increased with air speed. Under corresponding conditions on full scale the amplitude of the oscillations would become so large as to break the tailplane at speeds within the normal flying range of the airplane. The mean forces thus produced would tend to produce an upward fracture such as was observed. The Subcommittee recommends that buffeting be further investigated and that steps be taken to place the measurement of turbulence in the air, described by pilots as bumpiness, on a definite scientific basis by the carrying of accelerometers or by other means.

GERMAN AVIATION

Aviaticus—Yearbook of German Air Transportation, 1931 (Aviaticus—Jahrbuch der Deutschen Luftfahrt, 1931). Published by Interessengemeinschaft Der Deutschen Luftfahrt, Reichsverband Der Deutschen Luftfahrt-Industrie. E.V., and Deutsche Luft Hansa, A.G., 396 pp. 33 figs., many tables.

THIS yearbook of German aviation is somewhat similar to "L'Année Aéronautique," published by the Société du Carburateur Zenith, and to "Jane's All the World's Aircraft," but, as its name implies, it emphasizes the transport side of aviation and refers only to this phase of foreign aviation. The book goes into much greater detail regarding the development of its own air transport organizations and its own aircraft and plane manufacture than the other two reviews but omits specifications of planes and engines. Maps of the air-transport lines all over the world are given, and one chapter is devoted to government organizations of all countries for classifying and approving the design of planes and engines. Sections are also devoted to the foundation of world air traffic laws, and to the international air organization.

Aerial mapping in Germany, airports, developments in transport and sport planes, ground organizations and aviation centers, exhibitions, development of air insurance in 1930, safety precautions, names and addresses of aviation magazines all over the world, world aviation literature published during 1930 are also given. The chapter devoted to the development and present organization of the various aeronautical research institutes and colleges in Germany is very interesting. The inclusion of a list of the names and addresses of people in Germany who are prominent in aeronautics makes this rather a unique type of review.

AERONAUTICAL EDUCATION IN FRANCE

The National College of Aeronautics (L'Ecole nationale superieure de l'Aeronautique). "Genie Civil," Vol. 97, No. 5, Jan. 31, 1931, pp. 118-120.

ORIGIN, development, present entrance requirements and curriculum of the Ecole Nationale Superieure de L'Aéronautique for the training of French aeronautical engineers are discussed. Those admitted to the school are classified into six groups. The engineering students provided by the Ecole Polytechnique and other sources at the end of the course receive the title of engineers of the second class in the Corps de l'Aeronautique. The French official students receive the diploma of civil engineer of aeronautics. Foreign official students may be authorized by the Air Ministry to take the courses and French government officials upon showing aptitude are admitted. Foreign students are admitted to the school upon request of their governments, and finally observers may listen to the courses without receiving a diploma.

AERODYNAMICS

Aerodynamic Research in 1930, E. F. Relf. "Aircraft Engineering," Vol. 3, No. 23, January, 1931, pp. 13-14, 1 fig.

THE major aerodynamic research undertaken during the past year by the National Physical Laboratory is outlined by the Superintendent of the Aerodynamics Department of that organization, special reference being made to wind-tunnel design and fluid flow. Attempts toward improving the methods of visualizing flow in air are described with details of two useful methods evolved. The success attending the tests of large-scale models of the Schneider Trophy seaplanes in the Duplex wind tunnel led to a very heavy demand on this tunnel in connection with the development of new aircraft, especially the large multi-engined planes. Provision was made to install motors and suitable gearing inside the models so that the propellers can be run and the slipstream effects on control investigated.

ENGINE RESEARCH

A Harmonic Analysis of the Torque Curves of a Single-cylinder Electric Ignition Engine When Throttled to Various Mean Indicated Pressures, with an Appendix on the Estimation of Forcing Torques in Multi-cylinder Engines, N. S. Muir and A. Terry. (British) Aeronautical Research Committee—Reports and Memoranda No. 1305 (E. 41), 13 pp., 11 figs.

THIS work has been undertaken to fill the gap in the Fourier analysis of the gas torque curves for a single cylinder of a four-stroke electric-ignition engine, throttled to various indicated mean effective pressures in order to calculate forcing torques and the relative importance of the various orders of torsional vibration in the crankshaft of a multi-cylinder engine. The analysis has been made up to the twelfth harmonics of the cosine and sine components of the gas torque for a single-cylinder Liberty engine.

Indicator diagrams corresponding to the engine conditions when throttled to various indicated mean effective pressures were deduced from an actual diagram taken at 1600 r.p.m. with a 5.3 to 1 compression ratio. The harmonic components of the corresponding gas torque curves have been evaluated for use in any subsequent work relating to torsional vibration of crankshafts or to engine dynamics generally. The inertia torques due to the connecting rod and reciprocating masses have also been considered, so that the resultant crank effort may be computed if required.

AILERON TESTS

Hinge Moments of Balanced and Unbalanced Ailerons on R.A.F. 14 Wing, to Large Angles of Incidence, F. B. Bradfield and R. A. Fairthorne (British) Aeronautical Research Committee—Reports and Memoranda No. 1331 (Ae. 463), May, 1930, 9 pp., 8 figs.

THE investigation reported was made with a view to extending the range of hinge moments on ailerons to large incidences and to large negative aileron angles, such as might be used with differential gearing, and in a spin. The hinge moments were measured on an unbalanced aileron on a R.A.F. 14 section monoplane wing, with hinge set-back 30 per cent, symmetrical nose, pointed and round, and with a balance plane of Avro type but below the wing in various positions.

It was found that the set-back hinge provided balance up to large angles of incidence of the wing, but that, when nearly balanced, the hinge moment curves were of erratic shape at 30-and-40 degree incidence. The round-nosed aileron had more balance than the sharp nosed one from O-to-20-degree incidence. The Avro type balance plane provided an efficient balance only for small aileron angles and small angles of incidence.

SEAPLANE LANDING STRESSES

Landing Stresses on Seaplanes (Uber den Landestoss von Seeflugzeugen), W. Pabst. "Seitschrift für Flugtechnik und Motorluftschiffahrt," Vol. 22, No. 1, January 14, 1931, pp. 13-28, 28 figs., 6 tables.

A PREVIOUSLY developed theory concerning the landing stresses of seaplanes is discussed and the applicable range of a previously developed formula is expanded. Remarks on the landing stresses measured on models and full-sized planes, from later tests, are made and measuring devices employed are described. The strength ratio from stress measurements on a HE-9a flotation gear, with flat, and with keeled floats, is reported, and the results discussed. The theory is compared with the measurements taken in the tests. The results appear good in general, even to the satisfactory agreement upon the influence of keels, for which the D.V.L. accepted loads are too small and the theory, nevertheless, too favorable.

Greater tension measurements of flotation gear strains, further pressure measurements on the bottom of the HE-5 floats, and deflection measurements on the bottom of flying boats are mentioned. Very good agreement with the theory is shown in verified American tests. For further treatment of landing stress problems, upon the importance of measurements taken in the sea, such as shown in the significance of vibration tests on airplanes, further measurements for the evaluation of safe landing stresses are proposed.

Report of the Deutschen Versuchsanstalt für Luftfahrt.

(*Continued on page* 112)

PERFECT BALANCE OF PLANES AND PRICE



BRINGS THE BUSINESS TO CURTISS-WRIGHT

See Curtiss-Wright's fleet for 1931 and you'll see seven new models so sleek in design, so ruggedly built, so simple to operate and to service that they speed Flying's progress faster than ever before. ● Here are the industry's outstanding craft . . . conceived by its keenest engineers, built by its first and foremost builder, backed by its only nation-wide Service Base chain, and distributed by its ablest Dealers. ● For into the development of these planes Curtiss-Wright has put vitally significant ideas and devices, evolved from years of experience in building aircraft for the entire field of flying. ● From the trim little *Junior* to the triumphant *Travel Air Sportsman* each of the new models will rule the sky-roads and the sales-rooms now and in time to come. ● For to the public, to pilots, to operators Curtiss-Wright is the best-known name. That's why the Curtiss-Wright Dealer Franchise is a document whose value you can depend on, an agreement that will help you grow!



CURTISS-WRIGHT

AIRPLANE COMPANY

ROBERTSON, MISSOURI

FACTORIES: ST. LOUIS, MO., WICHITA, KAN.

EASY TO BUY AND EASY TO FLY



CURTISS-WRIGHT "JUNIOR"

A real airplane completely equipped, fully licensed, that costs but $1490! A 2-place, tandem-seated monoplane that takes off and lands "on a postage stamp"... from fair sized lawn or pasture lot... and it's so easy to fly that two men with no previous experience, soloed it in a single afternoon! ● The "Junior" needs no costly private flying field or hangar. It's so simply and sturdily constructed that you can park it outdoors if you wish, or run it under a shed. It asks no pampering, presents no service problem. For like your automobile it's always ready for you to hop in and go! ● Actually the "Junior" takes off lightly from the tightest of fields... cruises for three hours at 70 miles an hour... hits 80 when you want it to... and, due solely to its pusher type construction, offers *perfect visibility* as clear as from the front seat of a roadster... glides down and lands at 28 m.p.h.—stops in 150 feet—as easily as you stop your car! ● Developed by aviation's leading engineers, the "Junior" benefits by all Curtiss-Wright has learned in producing record-smashing sport and commercial craft. ● See your nearest Curtiss-Wright Dealer or write us for his name. Ask for a demonstration and learn why it's easy to buy, easy to fly, and easy to service the Curtiss-Wright "Junior"!

ROBERTSON, MISSOURI ● FACTORIES: ST. LOUIS, MO. ● WICHITA, KAN.

STABILITY FOR SPORTSMEN

SIMPLICITY FOR STUDENTS

TRAVEL AIR

SPORT-TRAINER



Conceived and constructed by Aviation's outstanding engineering staff, this striking new Travel Air's stability for sport, and sturdiness for training is achieved by Curtiss-Wright's unequalled experience in the production of all types of planes. ● Ruggedly built, trimly refined, you'll like this smart little plane. It offers advances in stability, handling and servicing ease, which can be effected only when an organization builds for the whole field. ● Its clean-cut lines, its sleek streamlining, its speed in excess of 100 m.p.h. and cruising range of 500 miles, make it a craft of which you may be justly proud. ● Actually it's so stable in flight and so responsive to all controls that it's a real treat to fly it! Powered with the air-cooled Wright-Gipsy engine, with a **full tread,** shock-absorbing landing gear and brakes, this Travel Air is remarkably easy to control on the ground or in the air. ● In every detail it is designed to make flying and servicing by the owner as inexpensive as possible. Streamlining gives it sleek looks. That's why the Sport-Trainer will make a wide appeal to 1931 buyers!

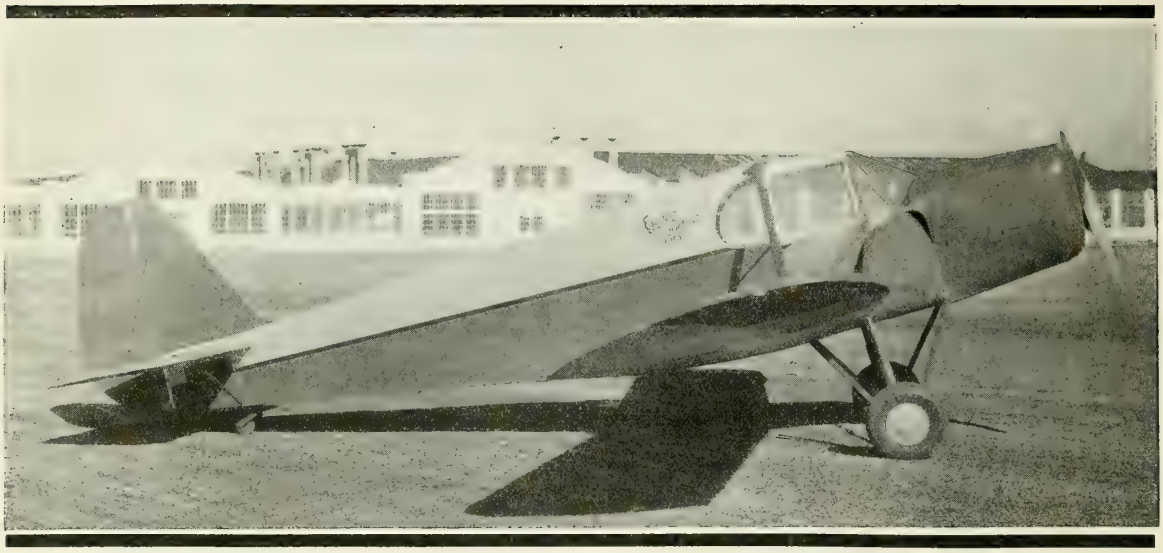
CURTISS-WRIGHT

AIRPLANE COMPANY

ROBERTSON, MISSOURI

FACTORIES: ST. LOUIS, MO. WICHITA, KAN.

A COZY, SPEEDY CLOSED PLANE FOR TWO THAT'S EASY AND INEXPENSIVE TO FLY!



THE CURTISS-WRIGHT COUPE

Curtiss-Wright's new COUPE is a 2-place plane remarkable not only for its closed-car snugness and comfort, but for its simple inexpensive operation as well. ● For two can fly cross-country in this trim closed craft as cozily and cheaply as in a car! The interior is beautifully finished, with deep upholstery. Noise is reduced to a minimum. You can fly 15 smooth, sure miles to the gallon of gas . . . and the design of the plane is so simplified you can service it yourself. ● So easy to handle, too. Sensitive dual controls, side-by-side; exceptional visibility which is made possible only through this sleek low-wing design; dependable brakes and tail wheel for easy control on the ground—these are features you will experience with pleasure when you fly this new product of Curtiss-Wright skill in engineering. ● Then there is the added satisfaction of smooth, flexible power developed by the Wright-Gipsy engine, which speeds this smart little COUPE through the air at 110 m.p.h. and reduces long, hard trips to pleasant jaunts. ● But after all you must see and fly the COUPE for yourself to appreciate fully the marked achievement of Curtiss-Wright in this and other 1931 models. Ask your Curtiss-Wright dealer for a demonstration or write the factory and let us arrange one for you. Off the ground—and go!

CURTISS-WRIGHT AIRPLANE COMPANY

ROBERTSON, MISSOURI ● FACTORIES: ST. LOUIS, MO. ● WICHITA, KAN.

MAKES A MINUTE MEAN TWO MILES IN CUSHIONED EASE AND COMFORT!

THE TRAVEL AIR SPORTSMAN



The racy new 3-place TRAVEL AIR *Sportsman* is a rugged, 2-miles-a-minute performer which rides with the ease and comfort of a touring car! ● Smoothly it glides down the runway... leaps skyward within 150 yards... climbs 750 feet a minute... levels off... strikes 120 m.p.h. if you wish... and with the endurance of its record-holding Challenger engine cruises easily over 600 miles in six hours! ● The sturdy *Sportsman* is an able sky rider and a cozy carrier for three because Curtiss-Wright designers, knowing what private pilots prefer, have put into this craft the progressive devices taken from their long experience in building many types of planes. ● It floats in and lands at 48 m.p.h. Special TRAVEL AIR shock absorbers, and split-axle undercarriage eliminate the shock of careless landings on rough fields. Internal expanding brakes assure ground control. The entire fuselage structure is made of strong alloy steel. Wide wings give you easy, sure, stable control. Convenience of seats, controls, instruments, and fittings—even to strap-cradle for extra luggage—make the *Sportsman* as comfortable as a car. ● Here is *your* plane, your *personal* craft. See your Curtiss-Wright dealer for a demonstration and you'll want to fly the *Sportsman* away!

CURTISS-WRIGHT

AIRPLANE COMPANY

ROBERTSON, MISSOURI

FACTORIES: ST. LOUIS, MO. WICHITA, KANSAS

1931 CHALLENGER ENGINE

MANY improvements, designed to add smoothness and longer life to moving parts, have been added to the 1931 model of the Curtiss Challenger six-cylinder, air-cooled, radial engine of 170 horsepower, which is being produced at the Buffalo plant of the Curtiss Aeroplane & Motor Company.

Basically, the Challenger is still the same engine which set world's endurance refueling records both in 1929 and in 1930, the latter still unchallenged successfully.

The first models of the Challenger, involving a new principle by which a radial engine operated with an even number of cylinders, were rough in operation and developed vibration. While the engine was adversely criticized, deservedly, it proved so reliable and so rugged that the engineering staff redoubled its efforts to improve the Challenger to a satisfactory degree.

Among the refinements added to the 1931 model, now fully as smooth in operation as any other engine of the same horsepower, are the following:

(1) Curtiss-Wright constant velocity cams with corrected timing synchronized with the articulating rod movement to secure an even exhaust note. (2) Lead bronze lined lower half shells fitted to master rods with three times the life of babbit shells. (3) Redesigned heater valve controlling exhaust gas heat to carburetor of high tensile aluminum alloy. (4) Improved crankcase nose fitted with laminated shim to eliminate end play in ball bearing behind propeller, especially after long service. (5) Substitution of copper asbestos gaskets for sheet gaskets where advisable. (6) Air cleaner, complete, with by-pass valve supplied as standard equipment.

In pushing the sale of the 1931 Challenger, several inherent advantages are claimed for the double row radial engine over those with an odd number of cylinders in a single row. They are:

(1) Simple carburetion can be employed, at the same time obtaining high mean brake effective pressure by using a supercharger. (2) Balance because heavy master rod loads are divided over two rods with less master rod piston wear. (3) Good pilot's visibility with no cylinder directly above propeller hub in pilot's line of forward vision. (4) Simplified exhaust manifolding.

With production for 1931 under way early, plane manufacturers are assured of adequate stores of the new engine for early delivery.



The 1931 model of the Curtiss Challenger 170 h.p. engine

THE G. E. LINE OF AIRCRAFT INSTRUMENTS

THE General Electric Company has announced a line of indicating instruments and operating elements for aircraft, including oil temperature indicators, cooling liquid temperature indicators, oil pressure indicators, fuel pressure indicators and air temperature indicators.

The new instruments are built in cases which conform to standard Army-Navy specifications. The temperature and pressure elements are separate units; those for oil temperature, oil pressure, fuel pressure and cooling liquid temperature are designed to be attached to the standard fittings, replacing the conventional temperature bulbs and pressure tubing. The elements for the air temperature indicators are arranged for mounting on any convenient part of the aircraft. These air temperature indicators are used for ice warning and wherever similar temperature indicators are desired.

All the indicators operate on the principle of current flow in a resistance bridge circuit. The current in a variable resistence is compared with that in a fixed resistance, the latter being part of the indicating instrument and the variable resistance being in the separate element. The resistance of the temperature element changes with temperature and that of the pressure element changes with pressure. But a small amount of current is required (approximately 50 milliamperes normally), the supply being a 12-volt battery or equivalent. The accuracy of the instrument is not affected by variations in battery voltage.

All the instruments are furnished with shock-absorbing cases which conforms to Army-Navy specifications, and permit flush mounting on instrument panels. The inside cases and operating mechanism float in sponge rubber carried by the outer cases. The outer cases protect the operating mechanisms from mechanical injury and act as magnetic shields to reduce interference with card compasses which may be located nearby.

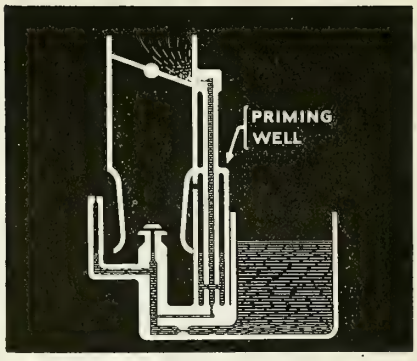
The instruments are accurately designed and carefully constructed to withstand severe vibration. All bearings are jeweled and luminous pointers and scales are provided.

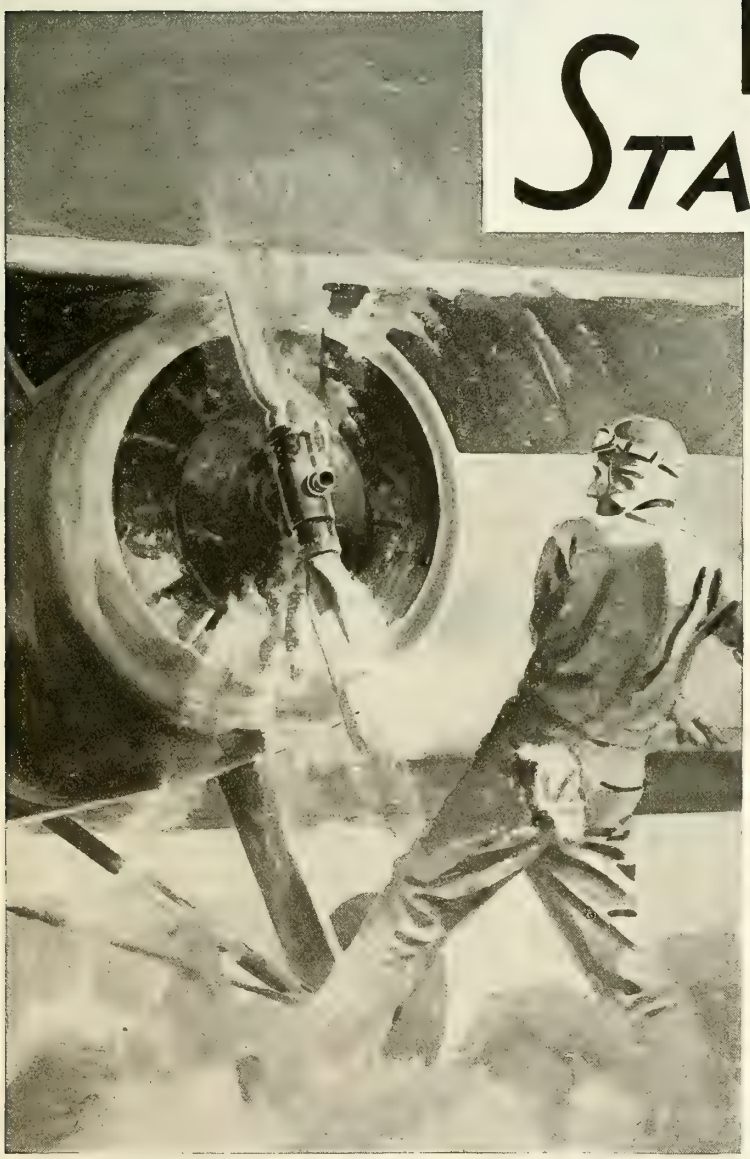
The temperature elements are resistances, sensitive to temperature. Their electrical resistance changes in accordance with the temperature to which they are subjected. For oil temperature and cooling liquid temperature, the elements consist of hermetically sealed metal cartridges threaded at one end for attaching to the standard fittings on engines or radiators. Inside the cartridges are the temperature-sensitive resistance coils, and connections are brought out for wiring to the indicating instruments. For ice warning and air temperature the elements are designed for maximum sensitivity with minimum drag. They are intended for mounting on struts, wings or fuselage members.

The pressure elements consist of variable resistances actuated by a copper bellows, totally enclosed in weather-proof, oil-tight metallic cartridges. They are threaded for attaching to the standard engine and fuel-line fittings. The oil (if oil pressure) or the fuel (if fuel pressure) enters the open end of each bellows causing it to expand in proportion to the pressure. This expansion changes the electrical resistance of the coil. Connections are brought out for wiring to the indicating instruments.

Advantages of the line as listed by the General Electric Company include:—(1) simplicity of remote indication, and elimination of tubing and mechanical connections; (2) light weight of relatively long-distance installations; (3) high accuracy and the ability to withstand vibration, and (4) the use of one indicating instrument to measure any number of corresponding temperatures or pressures successively by means of a selector switch.

EASIER STARTING





AIRCRAFT engines today are easier to start because Stromberg has developed a carburetor that will supply fuel to the engine at extremely low speeds.

A self-priming well in the Stromberg Aircraft Carburetor makes quick starting possible. The difficulty of low suction in the manifold is overcome. A turn of the propeller draws fuel through the idling well into the manifold — and the engine takes hold instantly.

This is one way Stromberg carburetors have helped make aircraft engines more convenient to operate—more satisfactory to use.

Stromberg engineers, with 22 years of carburetion experience, are at your service on all carburetion problems.

« *Over 95% of the aircraft engines now being built are Stromberg equipped* »

STROMBERG CARBURETORS

BENDIX STROMBERG CARBURETOR COMPANY

« DIVISION OF BENDIX AVIATION CORPORATION »

701 BENDIX DRIVE • SOUTH BEND, INDIANA

RECENT AIRCRAFT PATENTS

THE following patents of interest to readers of AERO DIGEST were issued recently trom the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N. W., Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

Aeroplane ascension apparatus. Frederick J. Ennis, Palmyra, N. J. (No. 1,787,438)

Parachute trip for kites. Charles G. Jacobi, Ridgefield Park, N. J. (No. 1,787,479)

Means for utilizing the forced draft of the propellers of aeroplanes. Gustav G. Schlam, New York, N. Y. (No. 1,787,495)

Airplane having a variable lifting surface. Jacques Gerin, Paris, France. (No. 1,787,517)

Two-cycle radial engine. Ambrose C. De Lange, Kalispell, Mont.; assignor to De Lange Improved Two-Cycle Motor Co., same place. (No. 1,787,673)

Lamp construction for airplanes. Samuel W. Hyatt, Connersville, Ind.; assignor to Indiana Lamp Corp., same place. (No. 1,787,823)

Collapsible pontoon for aeroplanes and the like. Ingwald M. Evensen, Toronto, Ontario. (No. 1,787,976)

Aerial navigation and protection. Oran T. McIlvaine, East Cleveland, Ohio; assignor to Radio Television Co., Cleveland, Ohio. (No. 1,787,992)

Projector (for projecting images of an object or stencil on the clouds). Preston R. Bassett, Rockville Center, N. Y.; assignor to Sperry Gyroscope Co., Brooklyn, N. Y. (No. 1,788,142)

Helicopter. Henry Wettstein, New York, N. Y. (No. 1,788,218)

Variable-pitch propeller. William S. Williams, San Luis Obispo, Calif. (No. 1,788,263)

Aviator's helmet. George W. Rogers, Dundalk, Md. (No. 1,788,320)

Aircraft covering. Isadore M. Jacobsohn, Chicago, Ill., and Starr Truscott, Birmingham, Ohio. (No. 1,788,394)

Dirigible frame. David E. Ross, Lafayette, Ind. (No. 1,788,595)

Avigation light. William A. Wulle, Chicago, Ill.; assignor to Pyle National Co., same place. (No. 1,788,650)

Braking device for airplane wheels. Francois Veyssiere, Paris, Marcel Jay, Levallois-Perret, and Jean R. Mondon, Bois Colombes, France. (No. 1,788,695)

Directional controlling means for aircraft. Hugo Junkers, Dessau, Germany. (No. 1,788,836)

Aerofoil. James Q. Hammett, Junction, Tex. (No. 1,789,000)

Safety appliance for airplanes. Erasmus M. Blacksher, Brewton, Ala. (No. 1,789,033)

Aileron. Joseph L. Cato, Buffalo, N. Y. (No. 1,789,215)

Airplane and propeller. Edward O'Toole, Gary, W. Va. (No. 1,789,252)

Flying machine. Edourd A. Perrin, Paris, France. (No. 1,789,254)

Manufacturing material for airplane uses. Frederick H. Auld, Columbus, Ohio (No. 1,789,288)

Operating mechanism for aircraft control surfaces. William Wait, Jr., Garden City, N. Y.; assignor to Curtiss Airplane & Motor Co. (No. 1,789,483)

Supporting apparatus for aircraft propulsion and sustaining means. Paul Maiwurm, San Diego, Calif. (No. 1,789,529)

Aeroplane brake. Clarence N. Hoyt, Belding, Mich. (No. 1,789,653)

Extensible and retractable airfoil. Carl H. Carlson, Los Angeles, Calif. (No. 1,789,925)

Airship. Nelson T. Shorts, Fern, Pa. (No. 1,790,078)

Wing construction for aeroplanes. Augustine C. Haller, Pittsburgh, Pa. (No. 1,790,144)

Aircraft propulsion means. Paul Maiwurm, San Diego, Calif. (No. 1,790,162)

Propeller for aircraft. Ernest G. McCauley, Dayton, Ohio; assignor to Hamilton Standard Propeller Corp. (No. 1,790,163)

Airport floodlight projector. Oscar Werner, South Bend, Ind.; assignor to Westinghouse Electric & Mfg. Co. (No. 1,790,184)

Focusing mechanism for lighting units. Oscar Werner, South Bend, Ind.; assignor to Westinghouse Electric Mfg. Co. (No. 1,790,185)

NOVEL WING CELL TO INCREASE LIFT

A HIGH-LIFT cell or vacuum chamber located above the fuselage has been utilized in a new type of plane developed by E. H. Lanier of Covington, Kentucky, to increase its performance over that of the conventional plane, according to the claims of the inventor.

This cell, which is a box like contrivance "air buffers" at the sides, creates an area of low pressure that is said to have twice the lift of the normal wing. Slower take-off and landing speeds and steeper descent at a lower speed are among the advantages the invention is claimed to afford. A plane of this type is now being tested at Lunken airport, Cincinnati, Ohio.

The vacuum chamber is mounted over the center of gravity, extends forward over the engine and backward half the length of the fuselage. The wing, which is of the full cantilever type, is attached in an unusual manner, being spaced apart from the fuselage to allow air to pass through the plane both vertically and horizontally.

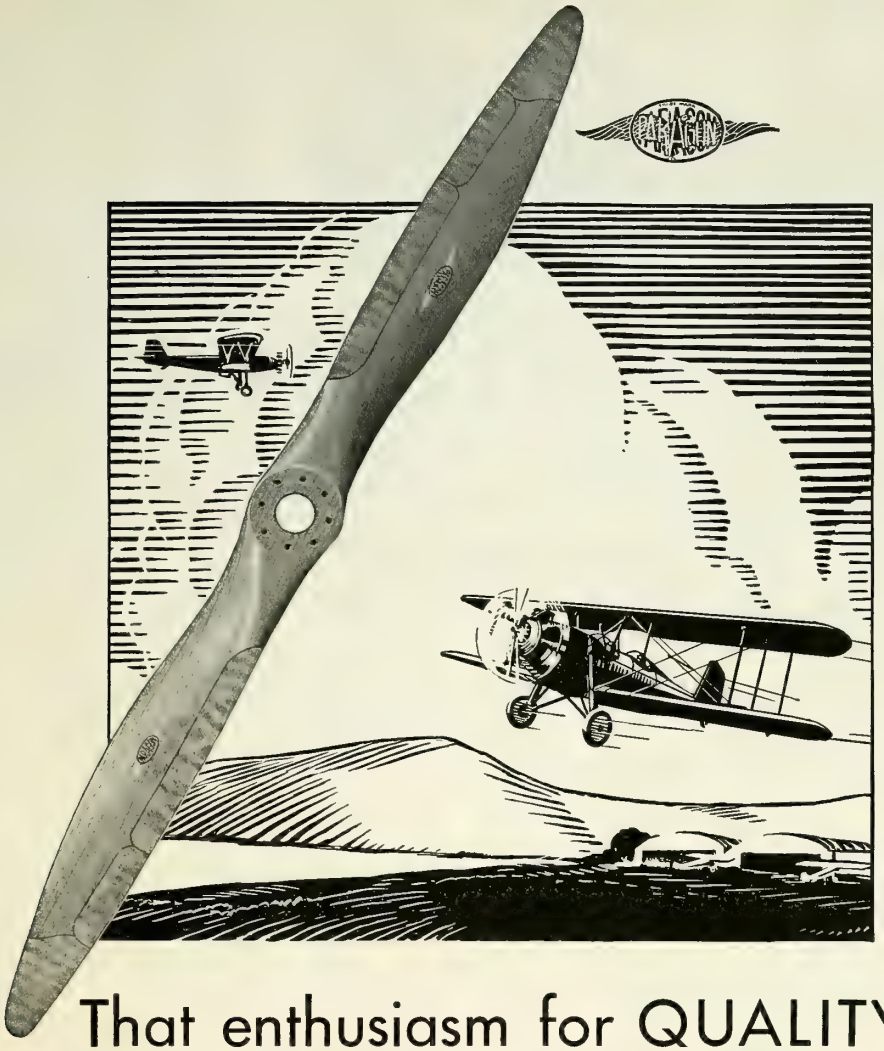
INVESTIGATION OF IGNITION SPARKS

IN N.A.C.A. Report 359, by Melville F. Peters, Wayne L. Summerville and Merlin Davis, is reviewed an investigation of effectiveness of ignitiontion sparks as determined by measuring the volume (or mass) of hydrogen and of oxygen which combines at low pressures. The sparks were generated by a magneto and an ignition spark coil. It was found that with constant energy the amount of reaction increases as the capacitance component of the spark increases. The use of a series of spark gap may decrease or increase the amount of reaction, the effect depending upon the amount and the distribution of capacitance in the circuit. So far as the work has progressed, it has been found that sparks reported by other investigators as being most efficient for igniting lean mixtures cause the largest amount of reaction. Differences between the amount of reaction with a magneto spark and an ignition spark coil were noted. The method appears to offer a means of determining the most efficient spark generator for internal combustion engines as well as determining a relation between the character of spark, energy and effectiveness in igniting inflammable mixtures.

Report 359 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.



Views of the Lanier monoplane with an auxiliary wing cell to increase its lift



That enthusiasm for QUALITY which spells SATISFACTION

Exacting inspections of woods, thorough craftsmanship in manufacture, these are habitual in the making of Paragon Propellers—not simply for their own sake, but to produce utmost satisfaction and economy in actual use. ¶ Back of these good habits is Paragon design; based on long experience; authoritative. ¶ On smaller ships to sell at popular prices, on larger ships with geared engines—use Paragon Propellers; for lightest weight, for lowest cost. You'll find it worth while to consult with Paragon engineers

AMERICAN PROPELLER COMPANY, SOUTH BEND, INDIANA

(Division of Bendix Aviation Corporation)

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Aviation Sales & Service Corp., Minneapolis, Minn.
Tred Avon Flying Service, Easton, Maryland.



CURTISS-WRIGHT COUPE

THE Curtiss-Wright Coupe is a two-place low-wing monoplane powered with a 90-horsepower Wright Gipsy engine.

Each wing is supported by one beam of chrome-molybdenum alloy steel. One beam only, instead of the two ordinarily used, extends from the leading edge of the wing to the center-of-pressure point. The wing curve is designed to maintain a practically constant center-of-pressure, its maximum travel being less than 4.5 of the chord length.

The stabilizer is adjustable on the ground. Self-balanced ailerons of steel tubing are attached directly to the wing beam by means of welded extensions terminating in hinges. They are actuated by push rods moving in lubricated guides.

The tail group is built of spruce, duralumin and chrome-molybdenum alloy steel.

A side-by-side seating arrangement is provided. The seats are adjustable. The baggage compartment is installed behind the seats. Large glass windows are provided to facilitate visibility. A window in the top of the cabin may be opened for ventilation.

Dual controls are standard equipment. The rudder pedals are swung at a convenient height. When the dual pedals are not in use, they may be raised and secured below the instrument panel. A pull handle installed on the instrument board is used to energize or lock the brake system. The ignition switch, throttle, gasoline shut-off valve and mixture control are within convenient reach. Standard instruments include tachometer, compass, altimeter, air speed indicator, oil pressure gauge, oil temperature gauge and fuel level gauge for the reserve tank.

A wide tread landing gear with oleo struts and semi-balloon wheels is provided.

Specifications

Wing span	38 feet
Height overall	8 feet
Length overall	25 feet
Wing area	188 square feet
Weight empty	1,136 pounds
Useful load	611 pounds
Gross weight loaded	1,747 pounds
Wing loading	9.29 pounds per sq. ft.
Power loading	19.4 pounds per h.p.
Gasoline capacity	30 gallons
Oil capacity	2.5 gallons

Performance

High speed	110 miles per hour
Cruising speed (at 1,700 r.p.m.)	90 miles per hour
Landing speed	45 miles per hour
Take-off (distance)	350-400 feet
Rate of climb	600 feet per minute
Cruising radius	450 miles
Fuel mileage (cruising speed)	15 mi. per gal.

CUSTISS-WRIGHT JUNIOR

DEVELOPMENT of the Curtiss-Wright Junior, a two-place pusher-type land monoplane designed for persons of moderate means, has been announced by the Curtiss-Wright Corporation. The ship combines a low initial cost with an economy of operation and is particularly intended for amateur sport flying.

The pusher-type design was adopted in the construction of the Curtiss-Wright Junior to give the pilot as unobstructed vision as possible while the plane is taking off, in flight or landing; and to eliminate the danger of persons coming into contact with the propeller while the plane is on the ground.

A Szekely three-cylinder radial air-cooled engine of forty horsepower is mounted at the trailing edge of the wing.

The fuselage is built of chrome-molybdenum alloy steel tubing. The wing, which is secured to the center section by four nickel steel bolts, is built of rectangular solid spruce beams extending from the center section through the wings; and ribs are of Hyblum riveted. The entire leading edge of the wing is covered with an aluminum alloy of three-ply birch. The CR-1 wing curve is used. Self-balanced ailerons of spruce are attached to the wing by steel hinges.

The tail assembly is of chrome-molybdenum tubing. The rudder is interchangeable with either of the two elevator units. The horizontal stabilizer is fastened by two nickel steel bolts in such a manner as to be adjustable on the ground. The vertical fin is an integral part of the fuselage.

There are two cockpits, one in the nose of the fuselage and the other under the wing. The cockpit rings are padded and placed high enough to protect persons riding in the plane. Dual controls are provided, making the ship available for training purposes. Standard equipment includes seat cushions, First Aid kit, Pyrene fire extinguisher and gasoline gauge.

The ship has an abbreviated landing gear, the fuselage having a clearance of about two feet when the plane is on the ground.

Among the features of construction designed for economy are interchangeable parts for making replacements, and removable wings, making possible storage in limited space.

Specifications

Wing span	39 feet
Length overall	20 feet 10 inches
Height overall	6 feet 4 inches
Chord	58 inches
Incidence	2 degrees
Dihedral	2.25 degrees
Gasoline capacity	8 gallons
Oil capacity	5 quarts

Areas

Wing	176 square feet
Ailerons	12 square feet
Stabilizer	13.5 square feet
Fin	5 square feet
Elevator	14.7 square feet
Rudder	7.3 square feet

Weights

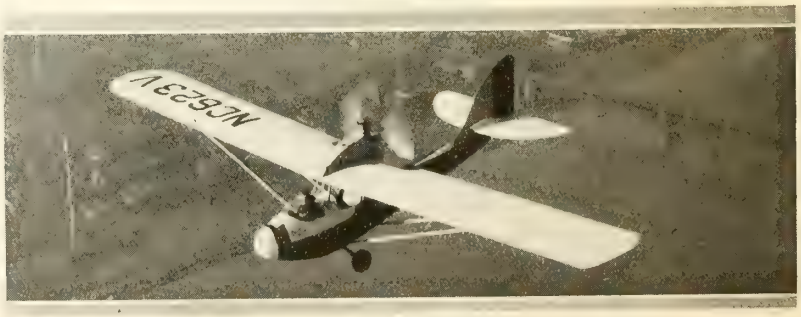
Structure	308 pounds
Engine	177 pounds
Equipment	25 pounds
Total weight empty	510 pounds
Crew	340 pounds
Fuel and oil	60 pounds
Baggage	10 pounds
Useful load	410 pounds
Gross weight loaded	920 pounds

Loadings

Wing	5.2 pounds per square foot
Power	21.2 pounds per horsepower
Load factor	6:5

Performance

High speed	80 miles per hour
Stalling speed	37 miles per hour
Landing speed	28 miles per hour
Take-off (distance)	150-200 feet
Rate of climb	625 feet per minute
Cruising speed (at 1,700 r.p.m.)	70 miles per hour
Cruising radius	200 miles
Fuel consumption (full throttle)	.3 gal. per hr.
Fuel consumption (cruising speed)	2.75 gals. per hr.
Fuel mileage (cruising speed)	25 mi. per gal.



The Curtiss-Wright pusher type two-seater of 40 horsepower

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DOUGLAS "DOLPHIN" AMPHIBION

THE "Dolphin" is a twin-engined amphibion developed by the Douglas Aircraft Company for commercial use in response to the demand for a high-speed six to eight-place machine of this type.

The hull is of dural construction throughout, divided into six compartments separated by five water-tight bulkheads. These compartments are made so that they are accessible for ease of maintenance. Access to the bottom and keel is gained by lifting a center board which comes out in sections throughout the entire length of the hull.

The bow compartment is separated from the forward baggage compartment by a water-tight bulkhead located just forward of the hatch cover. Access is gained to this compartment for maintenance purposes through a manhole which is held in place by machine screws. This forward compartment is installed for the purpose of making the nose exceptionally strong and so that should the bow be rammed and punctured the water will not get to any other portion of the ship. This nose is so constructed that any damage can be easily repaired.

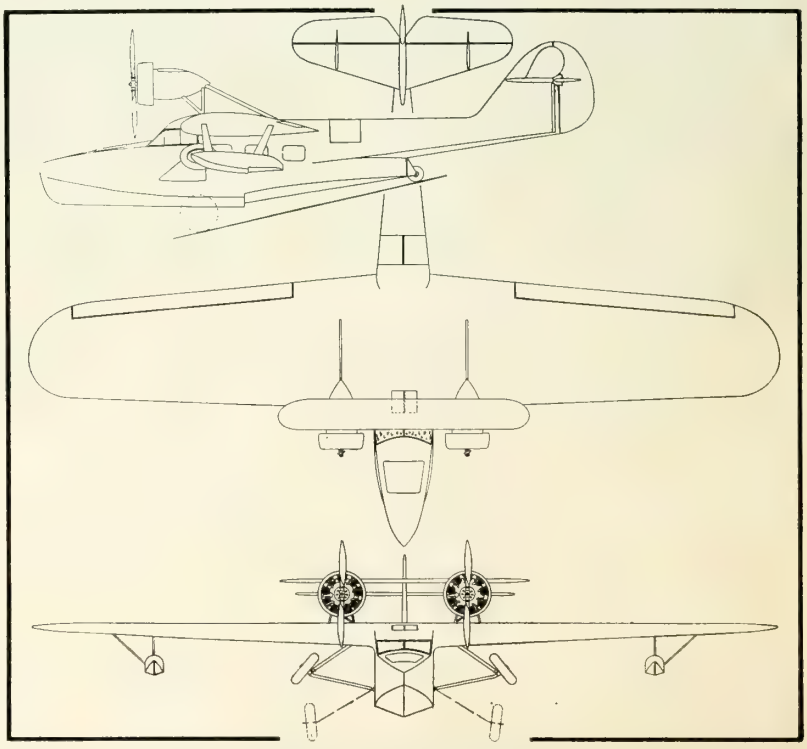
The forward baggage compartment has 50 cubic feet of space. Access is gained through a door 36½ inches by 21 inches and through the forward hatch, which is 27 inches by 23 inches. Anchoring and buoying is accomplished from this hatch with no danger of the crew's coming into contact with propellers.

The cockpit contains 97 cubic feet, is comfortable and affords excellent visibility for both pilot and co-pilot. Windows at sides and front are adjustable. The front windows can be opened six inches for direct visibility ahead without the pilot's getting any wind on his face. This is exceptionally valuable in thick weather. Entrance and exit to the cockpit is made through a door 42 inches by 20 inches or through a door 24 inches by 22 inches in the top of the cockpit.

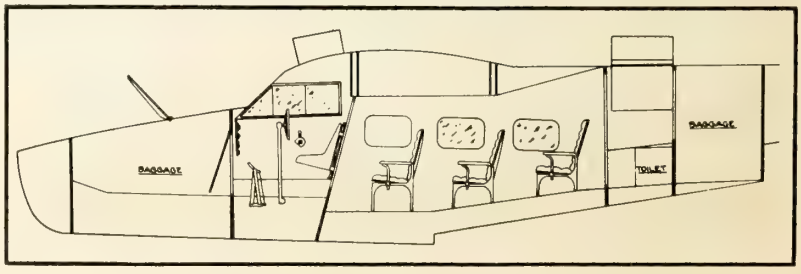
The pilot's and co-pilot's seats are adjustable and comfortable and will accommodate parachutes or cushions. Douglas standard brake pedals are used on the rudder pedals operating Bendix brakes. These brakes operate by a slight pressure of the toe. The rudder is effective and of sufficient area that in flying with one engine there is enough rudder action to turn against the engine which is doing the pulling without banking the plane. This makes the plane maneuverable on one engine. A swivel wheel column is used as standard equipment. The ailerons are effective and sensitive. The effectiveness of the elevator is such that no movement of the stabilizer (which is adjustable) is required to get the tail down in landing, nor any adjustment of the stabilizer with power off or power on.

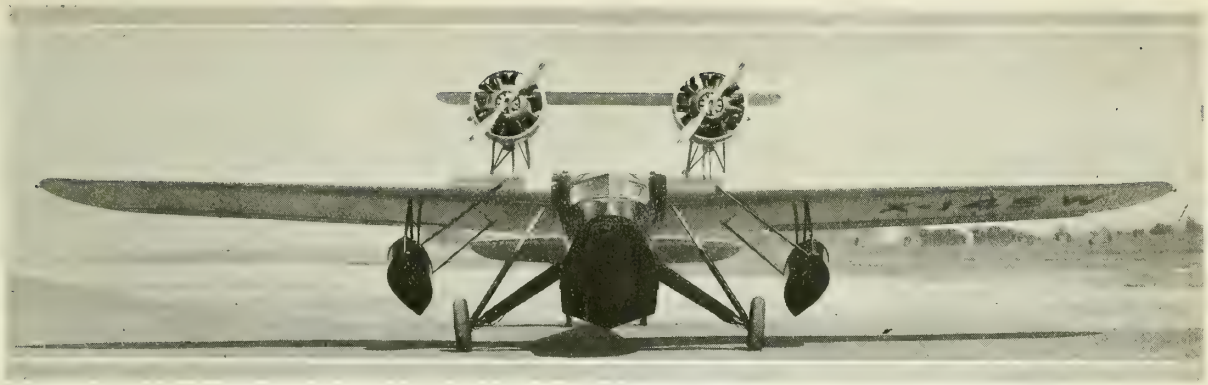
The following instruments are installed: magnetic compass; bank and turn indicator; clock; oil pressure gauges; oil thermometers; volt-meter; pressure gauges (1000 pounds); altimeter; air speed indicator; master switch; ignition switches; gasoline gauges; tachometers; and ammeter.

The passengers' cabin is 10 feet four inches long, four feet four inches wide and four feet six inches in height. The upholstering is attractive and durable. Six adjustable chairs with headrests are installed. The cabin is well ventilated and exceptionally quiet because of the distance at which engines are located. Six large windows give unobstructed view. The center window on each side of the cabin is removable and large enough to allow the exit of a large person with a parachute. The lavatory, aft of



Three-view outline and a section through the hull of the Douglas "Dolphin" amphibion





Front view of the twin-motored Douglas commercial amphibion showing wide track oleo landing gear

the cabin, is fitted with toilet, wash basin, running water, etc.

The rear baggage compartment is aft of the companionway and contains 30 cubic feet of space. The tail end of the hull is accessible through a manhole in the bulkhead aft of the rear baggage compartment and is large enough to accommodate a full grown man.

Entrance to the plane itself is gained through a door in the side of the hull which opens into the companionway. This door requires only two steps to enter. The ship is fitted with dome lights.

The wing is of full cantilever construction with a covering of spruce veneer which gives permanent rigidity and resistance to the elements:—tapered box spars of laminated spruce which are exceptionally sturdy and give a high factor of safety; truss type spruce ribs; and chrome-molybdenum steel fittings. The wing is assembled in fixed alignment without rigging. Navigation lights are provided and wiring for landing lights is installed. Walkways are provided on top of the wing for access to the engines. The wing section is the Clark-18 tapered to the Clark-9.

The pontoons of all-metal construction are located well out towards the tips of the wing. These floats do not take any of the weight of the plane but are used for balancing only.

The Aerol strut type chassis is fitted with hydraulic retracting mechanism which can be raised or lowered in 30 seconds, by either the pilot or co-pilot. The wheels are 36 inches by eight inches with a tread of 144 inches.

The tail surfaces are constructed of dural truss frames and dural covering. Both rudder and elevators are balanced and the stabilizer is adjustable. The tail surface areas in square feet are: stabilizer, 45.8; elevator 31.2 (total horizontal tail surfaces 77); main fin, 22.4; auxiliary fins, comprised of two fins at 5.5 square feet each, 11; rudder, 16.1; (total vertical tail surfaces 49.5).

A dual fuel system, with two tanks of 90 gallons capacity each, is used. The tanks are located in the wing outboard from the hull. The individual engine-driven C-5 fuel pumps are supplemented by a hand emergency wobble pump. The tanks are connected by a balance line, but can be shut off at will by means of a valve which is installed in the line. The fuel pumps are also connected so that either or both engines can be fed by either or both pumps from either or both fuel tanks at any time. This system provides the maximum safety factor.

All dural is anodically treated, primed and painted to Navy specification to provide the maximum protection. Colors are at the option of the purchaser.

Specifications

Wing span	60 feet
Length overall	42 feet 6 inches
Height overall	14 feet 7 inches
Chord (tapered)	132 inches to 84 inches
Dihedral	0°
Incidence	0°
Engines (each 300 h.p.) total	600 h.p.
Propellers (Hamilton-Standard) Diam., 9 ft.	

Areas

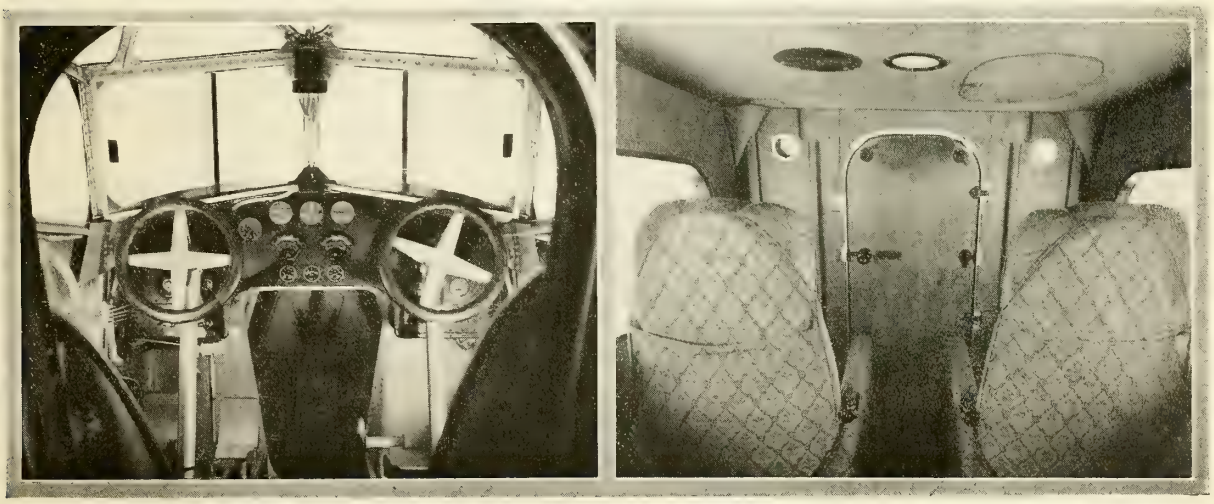
Wing aera with ailerons	515 square feet
Total wing area (including ailerons)	565 square feet
Auxiliary wing area	50 square feet

Weights (pounds)

Weight empty	5400
Useful load	2400
Gross weight	7800
Payload with 90 gals. gas	1725
Payload with 120 gals. gas	1545
Fuel capacity (180 gals.)	1080
Oil capacity (18 gals.)	135
Crew (1) and passengers (7)	1440
Wing loading	13.8 pounds per sq. ft.
Power loading	13 pounds per h.p.

Performance

High speed at sea level	136 miles per hour
Landing speed at sea level	60 miles per hour
Rate of climb	700 feet per minute
Cruising speed	108 miles per hour
Service ceiling	14,000 feet
Range	650 miles
Endurance	6 hours



Pilots' compartment and passengers' cabin arrangement on the Douglas "Dolphin" commercial amphibion

SPEED RECORDER FOR GLIDERS

THE Standards Gliding Club, Washington, D. C., has developed and flown a pressure-disk type of air speed recorder, which makes a permanent record of the take-off, gliding, diving and landing speeds. The instrument is one of a number of glider instruments used by the club, developed under the direction of H. B. Henrickson, of the Aeronautic Instruments Section, National Bureau of Standards.

In recording the flight, a stylus on the end of a horizontal push-rod, which is spring opposed, makes a fine black trace on a white chemically-treated paper, similar to that traced on the card of a steam engine indicator.

Each member of the club will record a flight during the year. The Washington Glider Club of the same city also plans to use this recording device.

Another instrument used by the Standards Gliding Club is a stall warning device. This device consists of an air pressure disk equipped with silver contacts which come together when the craft is approaching a stall. This contact sets off the buzzer and gives an aural warning to nose the ship down. Installed on a glider, the warning device will go off at 22 miles per hour and is accurate within one mile per hour. Another contact could be installed on this instrument which would warn when too steep a dive is made.



Standards Gliding Club glider showing air speed recorder on wing

LEONARD GLIDER

THE Leonard two-place dual control glider was developed by the Leonard Motorless Aircraft Company, Inc., of Grand Rapids, Mich., which company manufactures and distributes this machine. Two-place accommodation is provided for training purpose, and for carrying passengers on pleasure rides.

Each seat is equipped with a regulation airplane safety belt. Other safety features include a reinforced prow with which the main skid is equipped, and a rigid construction of the tail and wings. The entire fuselage is built of steel tubing welded at all joints.

The reinforced construction of the Leonard glider is designed to withstand the stress of automobile towing. Each glider is equipped with a positive trip release designed for launching by means of the towing or the shock-cord methods. The use of external wire rigging has been eliminated in the construction of this glider and as a result adjustments after each flight are not required. In addition, the lack of external rigging makes the glider easier to rig and maintain, according to the company.

Specifications

Weight	210 pounds
Wing span	34 feet
Chord	5 feet
Aspect ratio	6:8
Climb	800 feet per minute
Gliding angle in still air	15:1
Landing speed	19 miles per hour



The Leonard glider in flight

TESTING WELDS WITHOUT DESTROYING THEM

HITHERTO, the impossibility of testing welds without knocking them apart has been the greatest drawback to this method of uniting pieces of metal. Methods of testing welds in production without destroying them were explained by T. P. Watts of the Research Laboratories of the Westinghouse Electric Company in his paper presented before the American Welding Society at its fall meeting in Chicago, Illinois.

"For butt welds, in which the edges of steel bars or plates are welded together without lapping," said Mr. Watts, "we have developed magnetic methods of testing which can be successfully applied, using only simple easily portable apparatus, and which require very little skill and training on the part of the tester.

"The tests are made by 'bridging' the welded seam with a large horse-shoe electro-magnetic and 'exploring' the magnetic field in the vicinity of the weld with a meter.

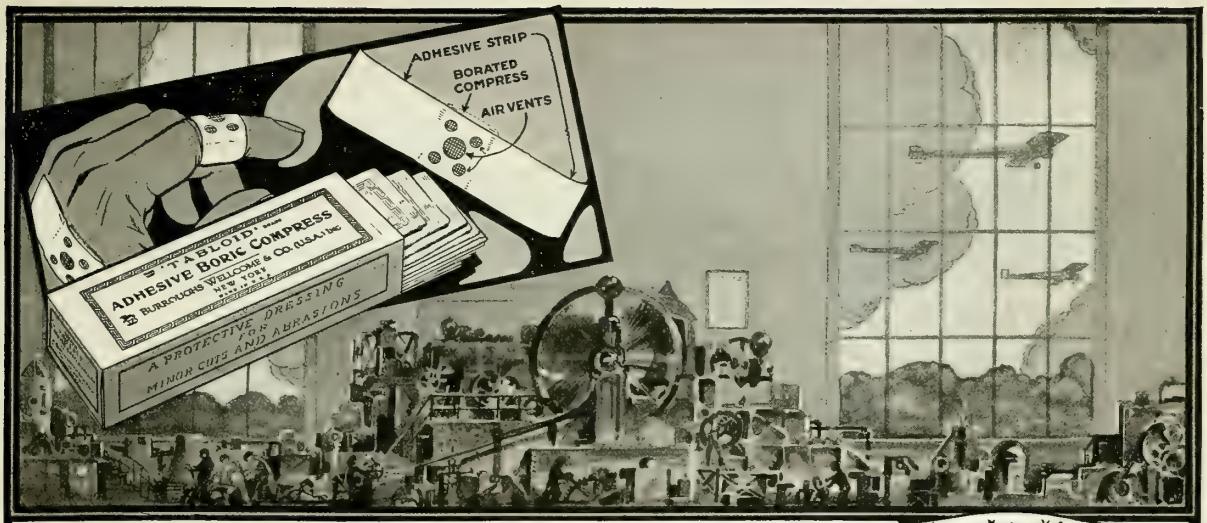
"This is really a further development of the method devised by M. Roux, a French investigator, to 'explore' the weld by placing iron filings on a piece of paper over the weld and observing the density of the filings as they are affected by the density of metal in the weld. This method, however, is good only when the surface is smooth and the faults are not too far below the surface.

"By passing the meter over the weld and watching the pointer, the quality of the weld can readily be determined. The meter indicates the 'reluctance' of the weld by 'reading' the magnetizing forces across the weld as compared with the magnetizing forces of the steel plate. If the magnetizing forces are about the same, the weld is good; if not, the weld is bad and the meter will tell just how bad it is.

"This method is practically indifferent to the depth of the fault below the surface and is only slightly affected by a rough, uneven surface. Various new types of weld test-meters are now being developed."



Two-place dual control glider produced by the Leonard Company of Grand Rapids, Mich.



Package shown in reduced facsimile

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RINEHART-WHELAN MONOPLANE

THE Rinehart-Whelan Company, operator of the Municipal Airport at Dayton, Ohio, is developing a new all-metal high-wing cabin monoplane with folding wings. It is built to accommodate two passengers in a side-by-side seating arrangement.

The powerplant is a four-cylinder, inline, inverted engine developing 110 horsepower. It is air-cooled and has an all-steel cylinder head integral, with overhead cams running in oil. It is geared at a ratio of two to one, the engine turning at 2,200 revolutions per minute.

It is expected that the performance figures will be improved when minor changes now under way are completed. Present figures are: High speed, 120 miles per hour; landing speed, 40 miles per hour; climb, 800 feet the first minute with a full load.

The manufacturers claim for the plane unusual flying characteristics, both as to stability and maneuverability, exceptional visibility and perfect ground control. Brakes on the plane are connected with a steering device on the tail wheel.

Mr. Howard Rinehart has been engaged in the aeronautical industry from its beginning. As one of the pupils of the Wright brothers, he learned to fly on the original Wright commercial planes. He instructed many of the pioneer pilots at the Wright school in Dayton. During the war he tested and demonstrated the Liberty-motored DeHavilland planes which were produced by the Dayton-Wright Company. His extensive experience in cross-country work, which has taken him to landing fields of every description, places him in a position to direct the design of a ship to meet the requirements of practical every-day service.

VARIABLE CONDENSER

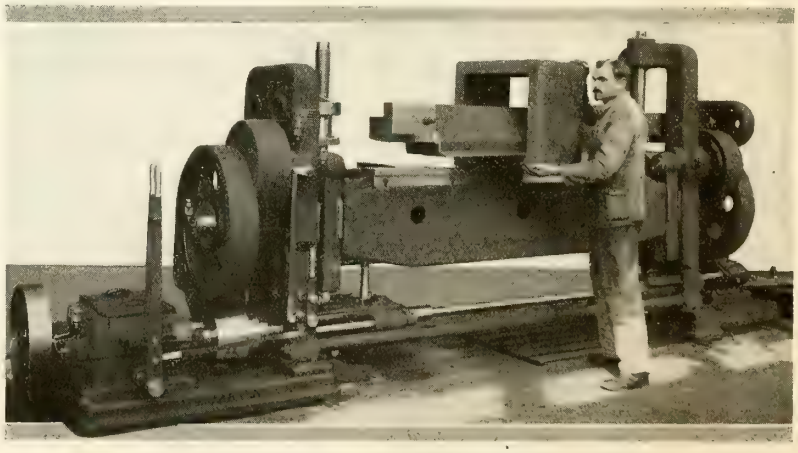
DEVELOPMENT of a new type of variable air condenser both for transmitting and receiving purposes, has been announced by the Allen D. Cardwell Manufacturing Company, Brooklyn, N. Y. The device, known as the "Midway" condenser, may be used in radio receivers, transmitters and oscillator-amplifier outfits. The condensers require a panel surface of 2¾ inches by 2⅛ inches and weigh from four to seven ounces. They may be used to replace large size transmitting condensers of capacities up to 150 mmfds.

SHEET METAL BRAKE

A SHEET metal and plate bending machine, known as the Schatz Universal Brake, has been developed by the Schatz Manufacturing Company, Poughkeepsie, N. Y. The machine is designed for hand or power drive in widths from forty inches to twenty feet, and for plate thicknesses from the thinnest available to 1⅛ inches thick. Provision of a swing-out top clamping bar is optional. This bar is designed to facilitate the making of closed forms, trays, boxes, tanks, etc., from one sheet of material.

The top clamping bar has a high adjustment which on the largest power machine goes to 28.5 inches, permitting the use of high angle forming blades. The bottom clamping bar and folding bar of the largest power machine may be lowered as much as 11¾ inches, permitting bends with a maximum radius equivalent to the maximum downward adjustment of the lower bars.

The blades of the top bar are instantaneously interchanged without the use of screws or bolts. The blade in the folding bar is slotted for quick change and is reversible for folding or bending thick and thin plates as desired.



The Schatz brake for sheet metal and plate bending

THE DEVELOPMENT OF AERO INSTRUMENTS

THE present state of the development of aircraft instruments, emphasizing the present trend of development, is summarized in N. A. C. A. Report 371, by the Subcommittee on Air Navigation Instruments. The report includes sections on instruments of speed, altitude, navigation, power plants, oxygen, aerial photography, and fog-flying. General problems and a summary of instrument and research problems are presented.

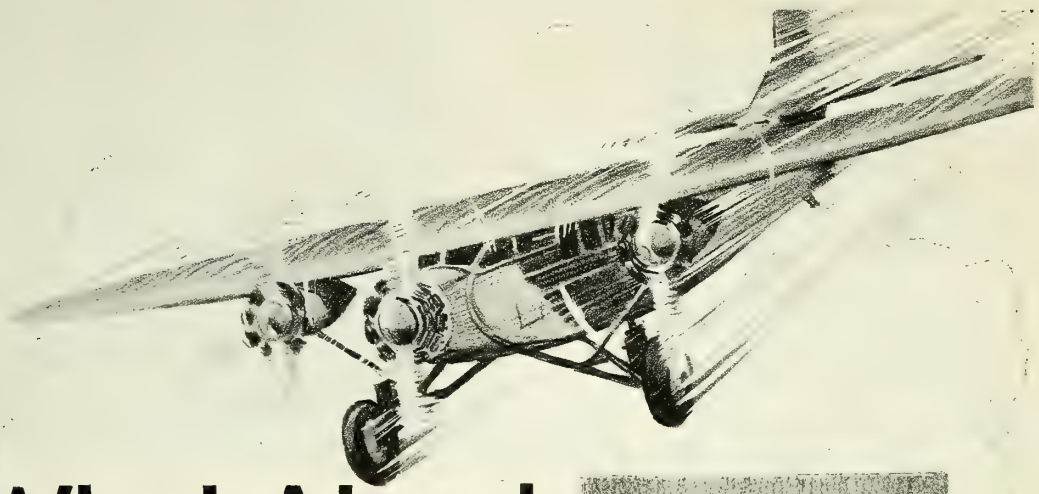
The relative utility of the various types of instruments available for any one definite purpose is discussed. The research problems considered includes both those of special interest to instrument engineers and to operators of aircraft.

NEW GASOLINE AND OIL TUBING FOR AIRCRAFT

DEVELOPMENT of a gasoline and oil tubing for aircraft, designed to minimize the possibility of a forced landing from breakage in fuel lines, has been announced by the Sky Specialties Corporation, Detroit, Mich. The tubing is built of fabricated rubber which is gasoline and oil proof and which is vulcanized to copper or aluminum.

The tubing may be either of aluminum or copper of any diameter. A special connection has been developed by the company for installation on each end of the tubing. These connections are provided with a sleeve which fits over the tubing for about one inch. The entire tubing and sleeve are covered and vulcanized with a gasoline and oil proof rubber and fabric.

If vibration cracks the metal line inside the hose, the rubber and fabric will continue to hold, according to the company. Eventually a small hump will form at the point of the break. During the course of regular inspection, the section where the break occurred can be replaced without difficulty.



What About the TUBING?



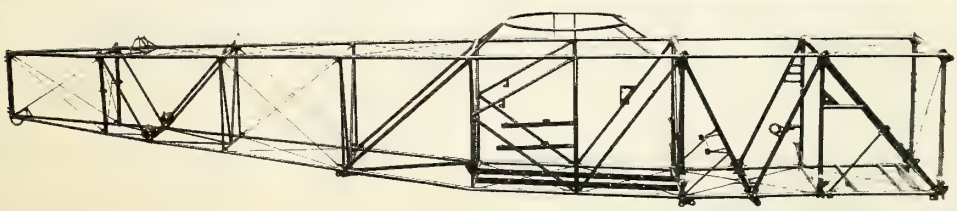
ARE you as sure of the quality of the tubing as you are of other parts of the plane? Do you know that it is just as practicable to predetermine the reliability of the tubing as it is the other equipment?

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NATIONAL-SHELBY AIRCRAFT TUBING

OBSERVATION AND BOMBING AIRPLANES OF GREAT BRITAIN

(Part II)

Paul E. Lamarche



The Hawker "Hart" powered with a Rolls-Royce engine

LAST month's article on British airplanes described in detail the Fairey III F, Fairey "Fox," Armstrong-Whitworth "Atlas" and the Westland "Wapiti" military biplanes. The accompanying descriptions of six types of airplanes complete the series of articles on British military planes in the observation and bombing category.

A. V. ROE & CO., LTD.

THE AVRO ANTELOPE

The Avro Antelope is a two-seater high performance biplane which can be used as a fighter, reconnaissance plane, high performance bomber or general-purpose plane. It is, however, built primarily as a high performance bomber, by A. V. Roe & Co., Ltd., of Newton Heath, Manchester. Power is supplied by a Rolls-Royce F. XI. B. water-cooled engine which develops 538 horsepower at 2,250 revolutions. The Antelope is a single-bay biplane of all-metal construction. The lower wing has a shorter span and narrower chord than the upper. The upper wing is carried above the fuselage by a short inverted V cabane. At point of attachment to the center section the wing spars are tapered so as to enhance the pilot's visibility. Further to benefit the pilot's forward view, the deck of the fuselage has a forward slope downwards, and the pilot's seat is adjustable vertically during flight. The wings are slightly swept back and staggered and because of the smaller chord of the lower wing the pilot's vision downward is further enhanced. The wings are built up with duralumin spars and ribs and have a covering of fabric. The upper wings are fitted with Frise type ailerons.

The fuselage is rectangular in section. It is constructed of duralumin, being built up mainly of L-angle channel. It is covered with duralumin plates riveted on. This construction has the advantage that it is rigid and requires no truing.

The empennage is of the monoplane type with welded steel construction, fabric covered. The stabilizer is adjustable in flight by means of a hand wheel in the pilot's cockpit. The landing gear is of the cross-axle type with oleo and rubber compression shock absorbers. The accommodations in the fuselage consist of the pilot's cockpit under the trailing edge of the upper wing and that of the observer-bomber immediately behind. The position of the observer-bomber is at a slightly lower level than that of the pilot, and his cockpit is provided with an adjustable seat. The armament consists of a single Vickers gun firing through the propeller from the pilot's cockpit and a Lewis gun over the rear cockpit. The rear gun is mounted on a special Avro gun ring of small diameter which has a patented feature incorporating a wind balance device. Bombs are carried on racks underneath the lower wings.

The engine is carried on a welded steel tube mount which is separated from the fuselage by a fire-proof bulkhead, and the radiator is carried in a tunnel formed at the bottom of the fuselage. There are two fuselage tanks for the fuel, a main tank and gravity service tank, the combined capacity of which is 86 gallons, giving the Antelope an endurance of four hours.

Specifications

(With the Rolls-Royce F. XI. B water-cooled engine)

Span, upper wing	36 feet
Span, lower wing	32 feet
Height	10 feet 9 inches
Length	31 feet 2 inches
Chord, upper	7 feet
Chord, lower	5 feet
Gap	5 feet 4 inches
Wing area	377 square feet
Weight empty	2,687 pounds
Useful load	1,852 pounds
Total weight loaded	4,539 pounds
Wing loading	12 pounds per square foot
Power loading	8.4 pounds horsepower
Speed, 5,000 feet	170 miles per hour
Speed, 10,000 feet	165 miles per hour
Speed, 15,000 feet	155 miles per hour
Speed, 20,000 feet	132 miles per hour
Landing speed	63 miles per hour
Cruising speed	145 miles per hour
Rate of climb, ground level	1,450 feet per min.
Rate of climb, 3,000 feet	1,500 feet per min.
Climb to 1,000 feet	.75 minutes
Climb to 5,000 feet	3.80 minutes
Climb to 10,000 feet	8.35 minutes
Climb to 15,000 feet	16 minutes
Climb to 20,000 feet	35 minutes
Service ceiling	20,000 feet
Absolute ceiling	21,500 feet
Cruising endurance	4 hours



Rolls-Royce powered all-metal Avro "Antelope" high performance bomber

H. G. HAWKER ENGINEERING CO., LTD.

THE HAWKERHART

ANOTHER light fast day bomber of remarkably high performance is the Hawker "Hart," which is constructed by the H. G. Hawker Engineering Company, Ltd., of Kingston-on-

Thames. The Hart can also be used as a fleet fighter or reconnaissance plane and can be fitted with floats for use as a seaplane. As mentioned in Part I of this article, the Hart has a top speed of 187 miles per hour at 10,000 feet when fitted with the Rolls-Royce F. XI.S engine. This high speed day bomber, which is the latest to be adopted by the Royal Air Force, is said to be the fastest machine of its type in production. It is all-metal in construction and has very clean lines which contribute greatly to its remarkable performance. It is built as a two-seater biplane with staggered wings with considerable sweepback. The lower wings are attached to short wing roots which are braced to the fuselage by struts. There is one set of N-struts on either side of the fuselage. The wings are built up with spars of two booms to which corrugated webs are riveted. They are covered with fabric. Frise type ailerons are fitted only to the top planes, which are also fitted with Handley Page slots.

The fuselage is in four sections constructed of steel and duralumin, the longerons and more highly stressed parts being of steel. The tubular members are round and flattened at the joints, and are assembled by flat plate fittings. In form the fuselage is rectangular faired to an oval section. The forward part has a metal covering; the tail section is fabric covered. The pilot's cockpit, under the cut-out of the upper plane, is armed with a single Vickers gun firing along a trough in the side of the fuselage. The observer bomber's cockpit is armed with a Lewis gun mounted on a standard ring.

Information pertaining to the bomb loading of the Hawker Hart is not at present available. The empennage is of metal construction with fabric covering and has a balanced rudder and a stabilizer adjustable in flight. The landing gear is of the cross-axle type, the front legs of which incorporate rubber springing.

The Hart is fitted with either a F.XIB or a F.XIS Rolls-Royce engine, depending on whether or not the plane is required to operate at high altitude or medium heights. The small frontal area of these Rolls Royce motors allows for an exceptionally well streamlined nose and gives the plane a very trim appearance:

Specifications

(With Rolls-Royce F.XI.B engine)

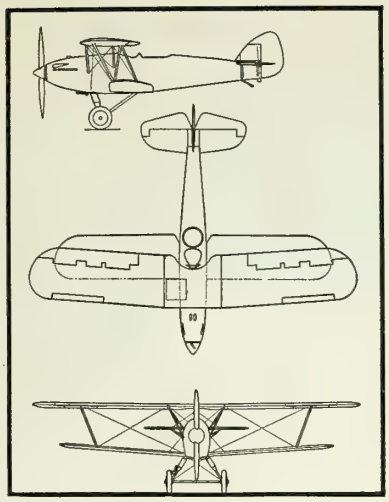
Weight fully loaded .....4,320 pounds
High speed .....184 miles per hour
Speed at 10,000 feet.....172 miles per hour
Climb at 10,000 feet.....8 minutes

(With F.XI.S supercharged engine)

Speed at 10,000 feet.....187 miles per hour
Climb to 10,000 feet.....7 1/2 minutes

The Hawker Horsley

The Hawker Horsley is a larger type of Royal Air Force standard day bomber which is also adaptable to coast defense operations, for which service it carries a torpedo suspended underneath the fuselage in place of the bomb loading. The Horsley is a single-engine two-bay biplane with wings of unequal span and thick section. The wings have top and bottom center sections, the upper being carried above the fuselage by two inverted V cabanes and united with the lower section by one set of splayed out N-struts on either side of the fuselage. The outer sections are braced by a pair of parallel interplane struts on either side of the fuselage. The wing structure is of spruce box spars and wooden ribs, covered with fabric. The ailerons are carried on the upper wing only. The tail planes are of the normal monoplane type, the stabilizer and elevators being of wood construction and the vertical planes of steel and duralumin. The rudder is balanced, and the stabilizer is adjustable in flight. All surfaces of the empennage are covered by fabric.



Hawker "Hart" bomber or fighter

The fuselage, rectangular in cross-section with a domed top, is built up in two sections. The forward portion extending from the engine mount to the observer-bomber's cockpit is of steel tubing; the rear portion is of spruce. With the exception of the forward part of the fuselage, which has a metal cowling, the fuselage is covered with fabric. The pilot's cockpit, located behind the trailing edge of the upper wing, is provided with an adjustable seat. The fuselage is so arranged as to provide a prone position for the bomber under and forward of the pilot's seat. There is a sliding panel for aiming bombs in the bottom of the fuselage. Bomb racks are carried under the fuselage and wings. The ship is further armed with one Vickers gun fired through the propeller from the pilot's cockpit and one Lewis gun mounted on a Scarff ring over the bomber's cockpit. The plane carries full wireless equipment and oxygen apparatus for altitude work.

The landing gear is of the divided type with a wide track. It is composed of two telescopic shock absorber legs with rubber in compression, which are mounted under the extremities of the lower center section with spars and two axles, the inner ends of which are hinged to the lower fuselage longerons. The bases of the telescopic front legs and axles are hinged by radius rods to two steel tube pyramids. The Horsley is usually fitted with a 690-horsepower Rolls-Royce geared Condor III water-cooled engine or a 700-horsepower Armstrong-Siddeley "Leopard" air-cooled engine. Fuel is carried in two wing tanks of 230 gallons total capacity, and 19 gallons of oil are carried in a fuselage tank. The Horsley when fully loaded weighs 7,800 pounds.

Specifications

(With Rolls-Royce 690-horsepower engine)

Span, upper wng .....56 feet 9 inches
Span, lower wing.....49 feet 10 3/8 inches
Length .....38 feet 3 inches
Height .....13 feet 7 inches
Wing area .....692 square feet
Weight empty .....4,760 pounds
Weight loaded .....7,800 pounds
Wing loading...11.2 pounds per square foot
Power loading..11.3 pounds per horsepower
High speed.....126 miles per hour
Speed, 10,000 feet.....120 miles per hour
Speed, 15,000 feet.....113 miles per hour
Landing speed .....58 miles per hour
Climb to 10,000 feet.....11.75 minutes
Climb to 15,000 feet.....24.6 minutes
Range with full load.....10 hours

HANDLEY PAGE, LTD.

The Handley Page Hare

One of the most interesting of the new high performance single-engine day bombers produced in England is the Handley Page "Hare," which is constructed by Handley Page, Ltd., of London. This all-metal plane, which is powered by the Bristol Jupiter VIII air-cooled engine, is a two-seater long-range sesquiplane. Besides day bombing, it can be used as a coast defense torpedo plane or for reconnaissance purposes. One of the most interesting structural features of the Hare is the new system of wing bracing which entirely eliminates rigging maintenance. With the exception of a few short wires at the center section, there are no others. Other features of the Hare are the very large overload capacity and the automatic slots which are made an integral element of the wing design.

The wings are of metal construction with fabric covering. The upper plane has a high aspect ratio; the lower has the same chord with a shorter span. The upper plane is attached to the lower by a sloping panel of streamlined N-struts. With the exception of a few bracing wires in the center section the Hare is free from all others. As Handley Page engineers point out, the advantages of this system of struts are: (1) a reduction of head resistance by substituting a single strut in place of cross-bracing wires; (2) a reduction of interference resistance as compared with the cross-wire braced structure; and (3) a reduction in weight. The ailerons are fitted to the upper wing only.

(Continued on following page)



The Handley Page "Hare" all-metal single-engined day bomber

(Continued from preceding page)

The fuselage, rectangular in section with a domed top, is of all-metal construction fabric covered. A feature of the two tandem cockpits is freedom from draughts. The pilot occupies the forward cockpit, though dual control can be fitted. The pilot's cockpit is armed with a single Vickers gun and the rear cockpit with a Lewis gun mounted on the standard ring. Complete photographic and wireless apparatus is carried as standard equipment. The bomb operator can assume a prone position. The empennage is of the normal monoplane type with an adjustable stabilizer braced from below. The fin and rudder are slightly offset to counteract the effect of the slipstream.

There are two types of landing gears which have been designed for the Hare, one of which is of the split axle type used when the plane's function is to carry a torpedo or a large bomb under the fuselage. The other landing gear is of the normal British cross-axle type. Both forms of landing gear are provided with Palmer pneumatic wheel brakes, which can be operated either by hand or foot. The 500-horsepower geared Jupiter VIII engine is carried on a tubular mount and is fitted with the Townend Ring. Fuel is carried in a large fuselage tank of 130 gallons capacity and two wing tanks of 28.5 gallons capacity each. Because full particulars in regard to the performance of the Handley Page Hare are still withheld by the Air Ministry, I am only able to give the following specifications:

Specifications

(With the Bristol Jupiter Series VIII engine)

Span	50 feet
Length overall	32 feet 2 inches
Height	11 feet 10 inches
Total weight	5,720 pounds

HANDLEY PAGE HINAIDI

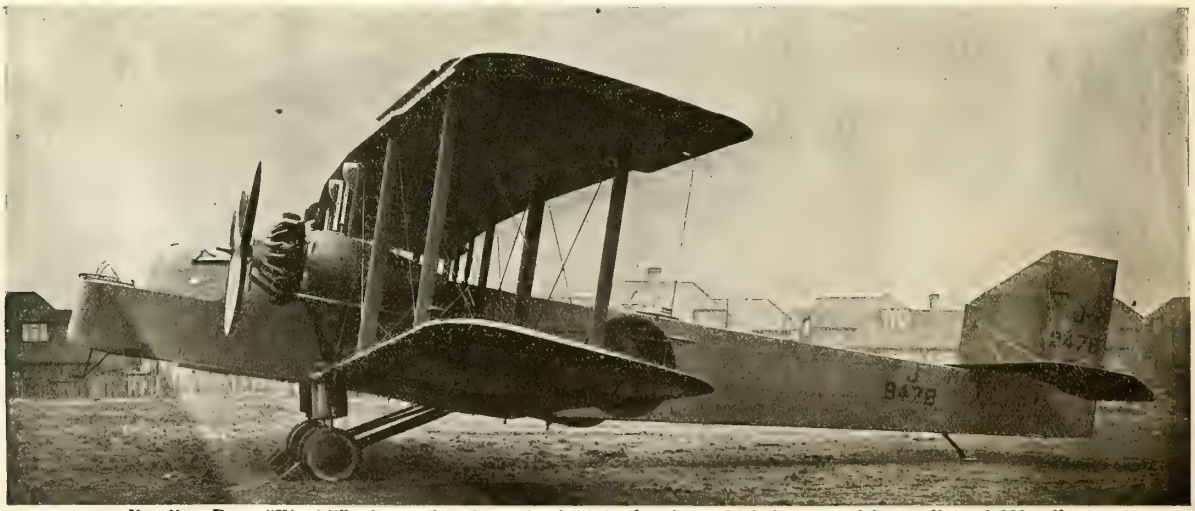
The Handley Page "Hinaidi," a twin-engine long-range night bomber of all-metal construction, is the successor to the Hyderbad. At present both Handley Page bombers are being used as standard night bombers of the Royal Air Force, and as mentioned in the first part of this article, they have been evolved from war-time Handley Page bombers. The present types, though smaller, are far more efficient and maneuver exceedingly well for planes of their size. The Hinaidi has a range of 800 miles and a maximum bomb loading of 1,500 pounds. Its cruising speed is 75 miles per hour. It has good lateral stability and can be flown and maneuvered with either engine. Normally the Hinaidi is fitted with two geared Bristol Jupiter VIII engines, though it can be modified to use Rolls-Royce F or Napier Lion water-cooled engines.

The Hinaidi is a biplane with unstaggered wings of equal span. They are braced by three sets of interplane struts on either side of the fuselage, the inner pair of which carry the engine mounts. Ailerons are fitted to both upper and lower wings, and the latter have a small dihedral. The upper wing is built up in three sections and the lower wing in two sections which are attached to short wing roots. Their structure consists of duralumin box spars with steel fittings and tubular ribs which are bolted to the spars, the whole of which is fabric covered.

The fuselage has a rectangular section which is built up with specially welded steel tubes cross-braced with swaged rods. It has a duralumin flooring and a fabric covering. The accommodations include a cockpit in the nose for a gunner-bomber and, in front of the leading edge of the wings, the cockpits for two pilots arranged in tandem. The two rear gun positions are arranged in a cockpit well behind the wings and allow a clear field of vision above and below the fuselage. The bomb load is carried under the fuselage and lower wings. There are several alternative loadings at either location. Beneath the fuselage eight 112-pound bombs may be carried or four 112-pound bombs and four 250-pound bombs. The alternative bomb loadings under the wings are two 520-550-pound bombs or four 230-250-pound bombs or six 112-pound bombs. The bombs are released by toggles in the first cockpit and also on the floor near the bombing aperture. Wireless and photographic equipment are carried as part of the standard military equipment.

The empennage of the Hinaidi is of the normal monoplane type with wire bracing above and below the adjustable stabilizer. The rudder is balanced. The landing gear has two independent units of two wheels each, mounted under the engines. The axle of each is supported at the ends of the telescopic legs, one of which reaches below the engine mountings and the other to one side of the fuselage in line with the rear spars of

(Continued on following page)



Handley Page "Hinaidi" all-metal twin-engined night bomber which has a cruising radius of 800 miles



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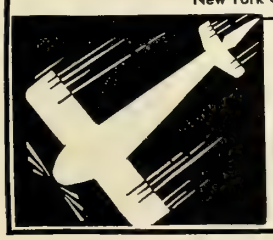


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(*Continued from preceding page*)
the lower wing. There is also a pair of thrust rods connected by a diagonal. The two Bristol Jupiter VIII motors are carried in streamlined nacelles mounted between the wings. The fuel capacity is 380 gallons and the oil capacity 44 gallons. Fuel is carried in two wing tanks under the center sections and directly above the engines, which are fed by gravity. The big Hinaidi bombing plane has an all up weight of 13,200 pounds, of which the service load is 7,260 pounds, which includes 1,500 pounds of bombs.

Specifications

(*With two Bristol Jupiter VIII engines*)

Span	75 feet
Chord	10 feet 1 inch
Length overall	59 feet 2 inches
Height overall	17 feet
Fuel capacity	380 gallons
Weight empty	7,240 pounds
Service load	7,260 pounds
Normal all up weight	13,200 pounds
Permissable overload	1,300 pounds
Service ceiling	14,500 feet
Speed, sea level	122.5 miles per hour
Speed, 5,000 feet	121.7 miles per hour
Speed, 10,000 feet	115.5 miles per hour
Landing speed	48 miles per hour
Cruising speed	75 miles per hour
Take-off run	306 yards
Rate of climb, sea-level	380 feet per minute
Rate of climb, 6,560 feet	500 feet per minute
Range	850 miles

BOULTON AND PAUL

THE SIDESTRAND

The Boulton & Paul "Sidestrand" is a three-seater medium range day bomber powered by two Bristol Jupiter air-cooled engines. It is built by Boulton & Paul of Norwich, a company well known for its metal aircraft. The Sidestrand is a high-performance bomber with a range of 700 miles at a speed of 130 miles per hour when carrying a full military load of 2,180 pounds of which 500 pounds are bombs. The plane is used as a standard day bomber by the Royal Air Force.

The Sidestrand is a biplane with wings of equal span slightly staggered and with a slight sweepback. The upper wing is built up in three sections and the lower in four. The center section of the upper wing is carried on inverted V-cabane struts, and the outer sections are fitted with Frise type ailerons. There are two sets of interplane struts on either side of the engine mounts. The wings are built on box spars of the standard Boulton & Paul type. These spars are drawn from nickel-chrome-vanadium steel and are afterwards hardened to give a "proof stress" of 65 tons per square inch. The drag struts are tubular and are of steel or duralumin and are either solid drawn or of Boulton & Paul "closed joint" section, depending upon the gauge-to-diameter ratio demanded by the particular loading conditions. The ribs are of duralumin and the leading edge of the wing is a trough section of three-ply aluminum. The covering of the wings is fabric and the ailerons are on both wings.

The fuselage has a rectangular structure domed top and bottom, and has a well streamlined form. It is of metal construction with fabric covering. It is built up in three sections, the first of which extends to the front spar of the lower wings. The frame is of duralumin channels reinforced beneath by three-ply fairing. The extreme nose section has a separate monocoque structure hinged to the fuselage frame which can be opened to give access to the equipment inside, much of which is arranged on easily removable panels. The central section, which carries the wings, has a frame of solid drawn high-tensile steel tubes with machined steel fittings and is wire braced. The tail section is built up with Boulton & Paul "closed joint" steel tubes.

The empennage is of the monoplane type with an adjustable stabilizer. Elevators incorporate shielded horns and the rudder is the Servo type. Construction of the tail surfaces is similar to that of the wings—steel spars and duralumin ribs, fabric covered. The landing gear has a wide track and consists of two units each mounted below an engine. The front legs incorporate a compressed air and oil shock absorbing unit.

The accommodations of the Sidestrand include a gunner's cockpit in the nose which is armed with a Lewis gun mounted on a Scarff ring that can be fired almost vertically downward by virtue of the advantageous form of the nose. For bombing, the occupant of this cockpit may take a prone position. Just forward of the leading edge of the wings is the pilot's cockpit. Behind the wings is a third cockpit, for the rear gunner, which is armed with a Lewis gun on top of the fuselage. The occupant of this cockpit may also assume a prone position to gain a clear field for firing another machine gun downwards below the tail. Wireless and photographic apparatus are installed in the fuselage between the second and third cockpits.

The two engines are carried, one on each side, in streamline nacelles built into the wing roots of the lower wings. Each engine mount is carried on a frame which is hinged to the nacelle in such a way that the whole engine may be swung out to give access to the rear end without the necessity of disconnecting fuel, oil or control connections. The latest type of Sidestrand has Townend rings fitted over the motors, thus increasing the plane's speed by 12 miles per hour at 12,000 feet. Fuel is carried in two fuselage tanks with a total capacity of 230 gallons.

Specifications

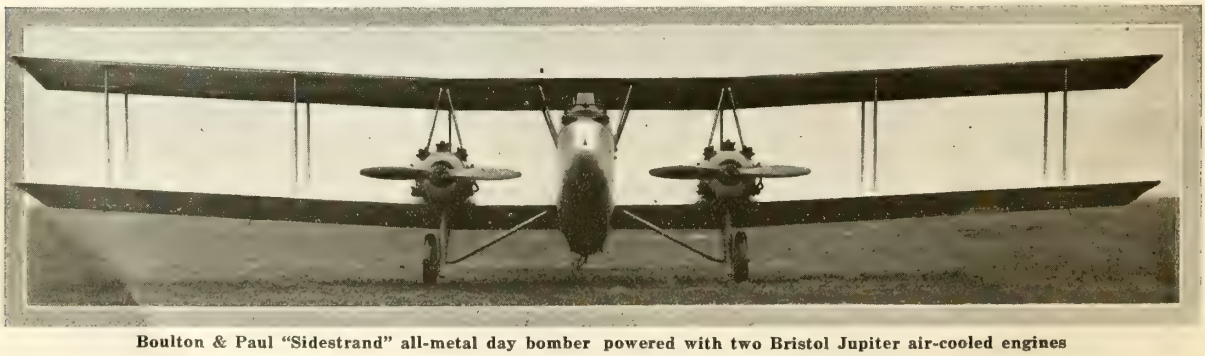
(*With two Bristol Jupiter Series VIII engines*)

Span	72 feet
Length overall	41 feet
Height	14 feet 10 inches
Chord (both wings)	7 feet
Gap	7 feet
Wing area	980 square feet
Track of undercarriage	19 feet
Weight empty	6,010 pounds
Weight of fuel	1,780 pounds
Weight of oil	230 pounds
Weight of military load	2,180 pounds
Wing loading	10.6 pounds per sq. ft.
Power loading	10.2 pounds per h.p.
Speed, 10,000 feet	140 miles per hour
Landing speed	54 miles per hour
Climb to 15,000 feet	19 minutes
Service ceiling	24,000 feet

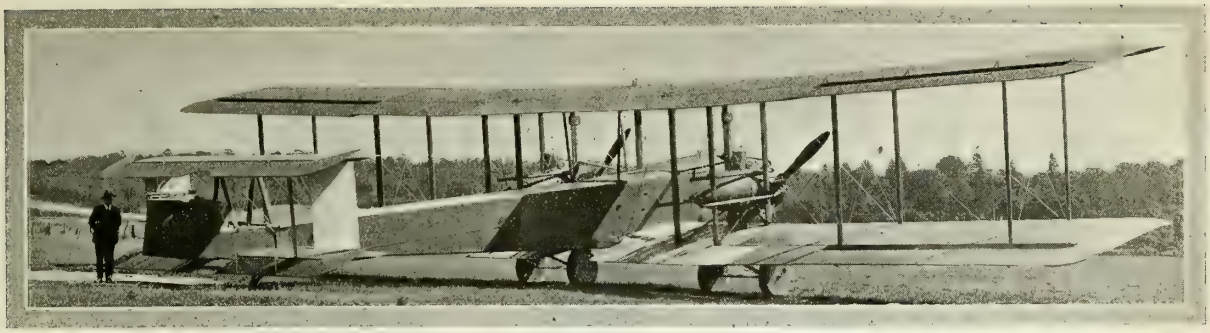
VICKERS (AVIATION), LTD.

THE VICKERS VIRGINIA X)

The big Vickers "Virginia" night bomber is built by Vickers (Aviation), Limited, whose works are located at Weybridge in Surrey. It is an extremely interesting type of twin-motor biplane night bomber, and, as mentioned in the introduction to this article, it is a development of the well-known Vimy



Boulton & Paul "Sidestrand" all-metal day bomber powered with two Bristol Jupiter air-cooled engines



Vickers "Virginia" long-distance night bomber with twin Napier "Lion" engines

bomber, one of which was the first to achieve a non-stop trans-Atlantic flight. The big Virginia X, which has been a standard heavy night bomber of the Royal Air Force for the past four years, is capable of covering a distance of 1,100 miles flying at 90 miles per hour at an altitude of 5,000 feet when carrying a military load of 3,500 pounds. It is well equipped for raiding purposes over long distances and is well defended against attacks from other aircraft. One of its interesting defensive features is a tail cockpit which allows the rear gunner to fire over a wide arc as well as downwards vertically.

The wings of the Virginia X are of equal span and are of the three-bay type. The wings are arranged to fold back around the center sections. The outer wing sections have a slight sweepback and dihedral. The center section includes the upper wing center section, which is in one piece, and the lower wing section which is in the form of two wing roots. Two pairs of slightly splayed out struts support the upper center section above the fuselage, and, in addition, there is a pair of interplate struts on either side of the center section extremeties. Near these struts are the engine mounts which are suspended between the wings. Each of the outer wing sections is braced by two pairs of duralumin interplane struts. The wing structure is composed of duralumin spars of Vickers patented "wandering web" type and tubular ribs and compression struts and the normal wire drag bracing, the whole of which is covered with fabric. The balanced ailerons are fitted to upper and lower wings.

The fuselage, which has a rectangular section, is built in three sections, each of which is a wire braced structure with tubular longerons and cross struts. The forward section is of steel construction and the middle section is built up with a duralumin frame. The rear, or tail section, has a steel structure and carries a tail cockpit for the rear gunner. The forward part of the fuselage, as far back as the trailing edge of the wings, is covered with plywood; the rest has a fabric covering except the tail cockpit, which has a covering of plywood.

The empennage is of the biplane type with two rudders. The lower plane of the empennage is attached to the lower fuselage longerons and the rudder posts serve as interplane struts. The tail surfaces are built up with duralumin frames, fabric covered and wire braced. There are no fins. Balanced elevators are on both upper and lower planes. The landing gear is in two units, one under each engine, of double V construction supporting two wheels each. The front legs are equipped with shock absorbers.

The accommodations of the fuselage are arranged with a cockpit in the nose over which is mounted a Lewis gun on a Scarff ring. Behind and above are the pilots' cockpits, which are arranged side by side. Behind this is the radio installation. The tail gunner occupies the rear cockpit.

The maximum bomb loading of the Virginia X is approximately 3,000 pounds with nine 112-pound bombs carried beneath the fuselage and two lower center section wing racks. Each of these can carry either six 112-pound bombs, four 250-pound bombs, four 230-pound bombs, two 520-pound bombs or two 550-pound bombs. The Vickers Virginia is normally powered with two Napier Lion 500-horsepower water-cooled engines or two Bristol Jupiter air-cooled engines, which are carried on mountings between the wings. The big Vickers bomber has a fuel capacity of 545 gallons which is carried in three 170-gallon tanks and one 35-gallon tank in the upper wing. The oil capacity is 30 gallons.

Specifications

(With two Napier Lion water-cooled engines)

Length overall	62 feet 4 inches
Height overall	17 feet 9 inches
Span	87 feet 4 inches
Span, wings folded	41 feet
Fuel capacity	545 gallons
Oil capacity	30 gallons
Weight empty	9,450 pounds
Weight fully loaded	17,600 pounds
Climb to 4,920 feet	9 3/4 minutes
Full speed at 4,920 feet	108 miles per hour
Ultimate ceiling	15,530 feet
Range at full speed	985 miles
Landing speed	51 miles per hour

THE LINCOLN "PLAYBOY"

THE Lincoln "Playboy" is a two-place pusher type parasol monoplane developed for sport flying by the Lincoln Aircraft Corporation, Lincoln, Neb.

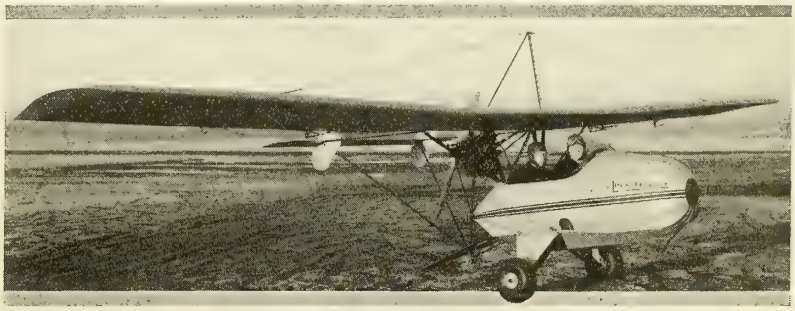
Instead of a fuselage of standard construction, the Playboy has a nacelle, in which is built a cockpit accommodating pilot and passenger. The ship is powered with a twenty-five horsepower Lincoln Rocket engine mounted on a framework extending from the trailing edge of the wing to the rear of the nacelle, and driving a pusher-type propeller.

Specifications

Wing span	35 feet
Length overall	14 feet
Wing area	137 square feet
Aileron area	12 square feet
Fin area	3 square feet
Flipper area	14 square feet
Weight empty	360 pounds
Weight loaded	740 pounds
Fuel capacity	5 gallons

Performance

High speed	80 miles per hour
Cruising speed	70 miles per hour
Landing speed	28 miles per hour
Climb, first minute	400 feet



The two-seater Lincoln Playboy with 25 h.p. Rocket engine

PERSONAIRLITIES



I AM often distressed, pained, hurt, and grieved to note the general lack of erudition among my six readers. It is, in a way, a reflection upon me. How, I ask myself, can they have read me for so long and yet remain so completely devoid of information on the most ordinary topics? Even though the editorial banner flying at the masthead of this literary caravel flaunts to the breeze the proud slogan, "We don't learn nobody nuthin'!"—even so, my six faithful followers, you should at least have a passing acquaintance with the science of ornithology. What! You don't even know what ornithology is?

Tut, tut! I might have known it! The letters I have received about the bird gracing this page should have told me that, to you, the science of ornithology was a mystery as deep and devious as the ways of a New York judge. All six of you have written in to tell me that no sea-gull ever had a wing-spread like the above bird. But, my poor friends, that bird up there is not a sea-gull. It is an albatross, as any one with a knowledge of ornithology, or even ornery chiropodology, would know.

Now, just to halt any of you who may feel an urge to write in that not even an albatross has a wing-spread like that, let me confound you with the information that the drawing was made by Bill Heaslip from a photograph of an actual albatross in flight, and is accurate in every detail of line and proportion.

Let me heap further confusion upon you by this, from the Encyclopædia Britannica: "The albatross is the largest sea bird, attaining a length of four feet, a weight of twenty-five pounds, and the unique wing-spread of seventeen feet; it is remarkable for its soaring flight." It is, in fact, one of the greater, if not the greatest, of all soaring birds, due probably to the extremely high aspect ratio of its wings, which are accurately depicted in Heaslip's drawing.

That it is an appropriate bird to grace my column appears from the following information from the Britannica: "It feeds upon fish, and when gorged may be unable to fly." How like me! Further—"Both sexes are white, streaked with dark bands on the back." If they'd added, "—of the neck," the similarity would have been rather more striking. "The bird lays one white egg, four inches long, on the ground." Well, it beats me there. But—"it nests on Tristan da Cunha and similar islands"; in which, of course, you observe the propensities of a lady ocean flier. "The joint courtship dance is remarkable." Well so, I might add, is mine; in fact, when performing what I might term politely a courtship dance, I've been thrown out of better joints than that albatross ever flew over.

Now, let's have no more complaints out of you fellows. Eh? What does ornithology mean? I haven't the least idea, but I'm sure it sounds well, like a Congressman's occasional mention of Farm Relief. I often chuck in a big word without extra charge to sort of liven up the piece. You don't have to pronounce it; if you can, you're one ahead of me. And now for some biographies.

AS you six readers know from my occasional mild complaints, it has long been my most cherished ambition to fineggle this department into writing itself. In which, of course, I merely follow the natural inclinations and hopes of all columnists and others who seek to live, with the minimum of toil, through the exercise of some such harmless racket as this. To date, however, I have enjoyed a singularly lean success. Despite my pleas for full biographies, replete with thrilling incidents calculated to entrance the reader, what I usually get is a cold statement of facts, dates and places, ending with, "Well, go ahead and fill in any details you can think of. Nothing ever happened to me, anyhow."



Claire Vance

Every now and then, however, a good Samaritan, getting my S-O-S and realizing that his biography is not only a help to me, but is also interesting publicity for aviation and the National Air Pilots' Association—of which he may be a member—sits down and dashes off a real autobiography.

With thanks therefore to the good Samaritan who favors us with a frank and human document about himself—and saves me a page of labor, bless him!—I introduce to you six readers one who needs no introduction to any one on the West Coast, Claire K. Vance, veteran pilot with the Post Office Department, now with Boeing Air Transport, who every once in a while adds 100 to the number of times he has flown over the Transcontinental "Hump" with the air mail between Reno and San Francisco Bay, in two and a half hours—a ten-hour trip by train. In October he completed his 2,500th flight over the Sierra Nevadas; and recently he flew a Boeing mail-passenger plane to Guatemala and Mexico in an experimental flight over a proposed mail route. In those more than 2,500 flights over the Sierra with air mail and passengers—but why should I run on like this when all I have to do is to step aside and say, "Gentlemen—Mr. Vance!"

"I was born in Logansport, Indiana, June 30th, 1897. I became air-minded from the day that a five-gallon can of water over a fire on the banks of the Wabash blew up from trying to hold too much steam and carried me along with it for a few feet of altitude. I really became interested about 1912 when Beachey and also a group of foreign pilots were touring the States on exhibition. During my first year in high school I built a biplane glider which was laboriously toted out to my uncle's farm, behind a spirited horse. A few attempts were made to fly it, but it all ended in dismal failure on account of the lack of proper hills and air currents. So far as I know, it still rests in the rafters of the barn.

"My spare time was spent working in a motorcycle shop where I constructed a wind wagon powered with a motorcycle engine with a pusher prop. This was fair, but it needed extra push to get her up much of a grade. A part of my summer vacation was usually spent at Winona Lake, Indiana, where Billy Sunday and a number of church conventions held forth during this time of the year. So you see, I really had the right start in life regardless of the fact that I finally turned out to be a mail pilot and a Q. B. At any rate, the motorcycle was carted to the lake and installed in a double pontoon affair and taxied over the water at ten knots an hour. It was in 1914 that a Curtiss seaplane arrived at the lake for exhibition flights. I've forgotten the pilot's name, but it was down at the R. R. station that I met Buck Weaver waiting for the plane's arrival to angle himself a job as mechanic for the setting up exercises. I managed to get the job of holding the tools and later wiping off the grease, for which services I was allowed to sit in the pilot's seat.

"In my senior year at high school I started construction of a plane, but the end of the term luckily terminated this project. I since agree with the professor that I'd rather be a live coward than a dead hero.

(*Continued on next page*)

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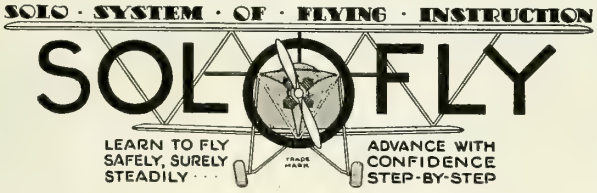
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(PersonAIRlities continued)

"In 1916 I entered the University of Illinois in the Aeronautical Engineering course, but quit the next winter, joining the Aviation Section of the Signal Corps as a buck private, February 20th, 1917. This after deciding that our entry into the war was but a short time away, and after failure to get in as a sergeant in the Reserve which required a longer time in college. I was sent to Memphis, Tennessee, with the Fourth Aero School Squadron, and after learning that an occasional enlisted man was put on flying, I informed the C.O. that I would like some of the same. It being the period just before the war when activity was a little lax, I soon received my wish and started my flying career with Al Johnson (Johnson Airplane and Supply Company). We had the original issue of the JN and flew out of the Memphis race track. I believe the horses, daily working out around the track, were the first air-minded horses in the country.

"Shortly after the declaration of war, we loaded the whole squadron in day coaches and freight cars and headed for Ashburn Field at Chicago. By this time more students were arriving and, being an enlisted man, I had to get my instructions between meals, so to speak. About the first of July we moved to Rantoul, Ill., and were made into the 16th Squadron. I had now moved up through all the non-commissioned ranks and had charge of a hangar and now was able to get in a few more hours of flying.

I finally was turned loose by Shorty Schroeder, took my R. M. A. and left for overseas November 1st, 1917, where my commission finally caught up with me. At Issoudun I volunteered for night bombing, but this failed to materialize and I went to Tours, where I remained until the Armistice as a Staff pilot, instructing observers how not to shoot the tail off our own planes in machine gun practice. I was quite disappointed that I could not see active service, but may be better off now. After the Armistice I went to the front with the 24th Observation (Salmson), who were at that time engaged in photographing the front line trenches for historical purposes. Consequently, I had a good look at the wreckage without being shot at.

"I arrived back in New York May 1st, 1919, and received my discharge, took my police dog, and started for home. Later I managed to hock the family jewels and bought a Jennie for barnstorming. After going through the Army without breaking a stick, I managed to wreck the Jennie beyond recognition. In April, 1920, I entered the Government air mail on the New York-Washington run and stayed there until the close of this run, when I was transferred to Chicago-St. Louis. Here we used Hisso Jennies and sometimes carried as much as six or seven pounds of mail. At the close of this run, July, 1921, I went to Reno, and what I've learned about that place since would take entirely too much time to write about.

"My first assignment at this new location was the Reno-Salt Lake run, which I flew until March, 1922. During this time I made a speed record from Reno to Elko of 170.2 m.p.h. in one of the old DHs, which still stands. However, the old DH didn't do it as much as the tail end of a low-pressure area." (Page Diogenes and his lantern; an honest man is found!—Cy.)

"After this run, I moved to San Francisco, where I have been since that time, except for the change of fields from one side of the bay to the other. I have made approximately 2,500 trips over the Sierras with two weather, one mechanical, and one 'out of gas' forced landings. The funny side of one of them was the riding of a mule back to civilization with the resultant eating off the mantel for a few days. On this occasion I was gone for two days and lost to the world. Of the eighteen planes taking part in the search, none of them saw me, although they passed so close I could hear them.

"I have had but one side trip to break the monotony of this long period on one run. That was a trip to Mexico and Guatemala on a survey flight for the Boeing company. This was during the revolution a year ago last spring. We stopped at San Jeronimo, half way between Mexico City and Guatemala, where we were surrounded by the natives bristling with arms. We were ordered to remain there on orders from Mexico City. Until our Mexican speaking companion could get to town and return with the cause of the rumpus, we were quite worried as to the results. It turned out that they were holding us until the flying hero of Guatemala arrived on his flight from the States to his native city. It seemed that some 40,000 people were waiting to greet him; and as a matter of courtesy, they didn't want us to arrive ahead of him and steal his thunder. As it turned out, he cracked up for the tenth time before he arrived at San Jeronimo and we were allowed to go ahead and land among the greater part of the crowd still waiting. Ours was the third plane in Guatemala City and naturally the curiosity was great.

"I am married and have a boy three and one-half, a girl two (still have the wife, too). My time in the air is about 6,500 hours and I still have the ambition to build airplanes. During my Frisco residence I have built one of my own design, besides a DH, and at present have a design on the fire from which I expect great results."



Vance became the neighborhood hero even if he only sat on the box-kite

A REQUEST for a biography from old man Cleveland brought forth this lengthy history. As it is quite typical of Pop, and would be spoiled if I enlarged it, I run it exactly as is. It's absolutely all that Pop cares to say about himself.



"Pop" Cleveland

"E. W. Cleveland, sometimes called 'Pop,' born in Naples, New York, 1890; associated with aircraft industry since 1911; served as a civilian instructor with the U. S. Army during the war; spent seven years barnstorming. Present connected with the Cleveland Pneumatic Tool Company, Cleveland, Ohio, manufacturers of Aerol Struts."

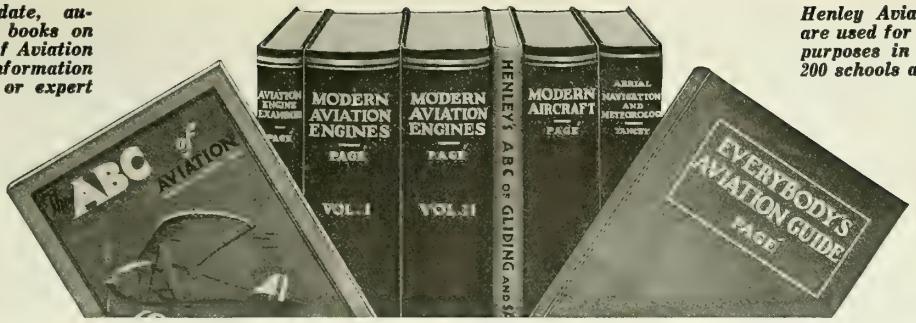
And there, so far as Pop is concerned, the matter can rest; he feels he has been sufficiently garrulous about himself. What the E. W. stands for in his name—perhaps Ebenezer Wilberforce, or Ezekial Witherspoon—I don't know. He's been Pop Cleveland so long that all else has been lost in the mists of antiquity. That the City of Cleveland, Ohio, was named after Pop Cleveland I believe, but cannot prove. If it wasn't, it should be.

He has a keen, dry, Scotch sort of wit that is most effective in argument—an exercise to which he is devoted. No one has ever won an argument with him. Even when beaten on all fronts, he has a reserve trench to fall back on from which he hurls this final unanswerable defiance at his adversary: "Well, if *you're* so damn smart, why aren't *you* rich?" His position in the National Air Pilots' Association corresponds to that of a burr between the saddle and the horse—the horse in this instance being ably represented by my friend Carl Egge.

ANOTHER welcome contributor to the Good Samaritan issue is Old Man Leyson's son, Burr, who helps me out with one of the briefest biographies I have received. Burr is the broken-down old war pilot who inspired a poet to write the "Wreck

(Continued on next page)

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(PersonAIRlities continued)

of the Hesperus." It seems they were both wrecked on bars—though the one the *Hesperus* hit was shy a brass rail. Burr was also Andrew Volstead's inspiration when he framed his famous Act—the word "framed" applies to the Act, not to us citizens.

Burr—so-called because of the tenacity with which he stuck to a glass—has now joined the ranks of the irreproachables and is a respectable, or practically respectable, business man. He rushes hither and thither, elbowing people out of his way, as the business representative of the great William Heaslip, aeronautical illustrator extraordinary. Bill Heaslip is extraordinary in that he draws and paints airplanes that look like airplanes—a feat apparently impossible for even first-rate artists who haven't been pilots.

Just a word about Bill Heaslip and Art before I hurl Burr Leyson's life history at a gaping world. Why is it that the average capable artist cannot or will not draw airplanes that look like airplanes, and not airfancies? The regular artistic procedure, with few exceptions, seems to be to sketch something that not even an eight-year-old boy slightly interested in aviation would recognize as a flyable airplane. Too often the thing produced is an airplane only in the imaginations of the artist and the art editor.

Why this should be, I do not know. The reproduction of an airplane on paper should not prove an impossibility for all but a few artists. The famous James Montgomery Flagg, for instance, once illustrated one of Elliott White Springs' stories in *Liberty* with an airplane rejoicing in perfectly square struts! The effect was refreshing, of course, but somewhat unsettling to those who like to take their airplanes straight. As for the *Saturday Evening Post*, its art editorial policy seems to be to exclude any artist who ever has seen an airplane, much less flown in one. I still recall the painful illustrations that accompanied Jim Bellah's superb air stories. By the way, don't you wish he'd come out of the drawing-room and do some more of them?

I'm not setting up as an art critic, for I know nothing about art. I know nothing about hens, either, but I think I can distinguish between a good egg and a rotten one. After all, one need not necessarily be a hen to judge eggs, nor an artist to judge art, which is defined by Webster as "The skillful and systematic arrangement or adaptation of means for the attainment of some desired end." Therefore, if the artist's "systematic arrangement" consists of wings too thin or too thick, airplanes with the center of gravity somewhere near the prop, rudders that are turned to the left when the airplane is turning to the right, ailerons that are inclined at absurd angles, struts that are round, or hind-side-before, planes shaped as no planes ever were shaped, then I conclude that the artist has not attained his "desired end," as Webster calls it. Certainly, if his end was to portray an airplane for my entertainment he has failed, for what he has pictured is anything but an airplane. And this



Bill Heaslip's impression of Burr Leyson

applies to nine out of ten of the artists who attempt aeronautical illustrations.

The art editor may reply that art does not consist of a photographic reproduction of an airplane or a person or a scene; that a slavish attention to details does not give the desired artistic effect. Probably not. But if practically all of the details are wrong, how can the total artistic effect be right? It can't be for me and for a large number of the public who have seen an airplane. After all, if an artist would draw a horse, he would do well to study a horse, and not depict it as a creature with horns, on the ground that horns add an artistic finishing touch to the animal.

All of which is merely to call to the attention of art editors throughout the land such expert aeronautical illustrators and former pilots as Bill Heaslip, Clayton Knight, Leonard Bridgeman and John MacGilchrist, who produce airplanes minus horns. As to the Art in their work, Mr. Editor, you must be the judge of that; I'll place an Approved Type Certificate on any airplane they produce—it will be quite airworthy. Incidentally, to dispel any thought that their accuracy of depiction results in a photographic or blue-print sort of art, I should add that these Big Four are distinct and utterly different in their methods. None of them need sign his work and I would recognize it at a glance.

And now for Old Man Leyson's son, Burr, who steps up to the microphone clutching his script which he will read to you over the National Network of the Caldwell Broadcasting System. Ladies and gentlemen—Burr Leyson, in person:

"This is not an autobiography; rather it is an obituary so far as flying is concerned professionally. Having completed some fourteen years of it, the old joints are starting to creak and the eyes blur from prohibition. It is time I join that crack group of pilots who make such marvelous flights nightly around some friendly oasis.

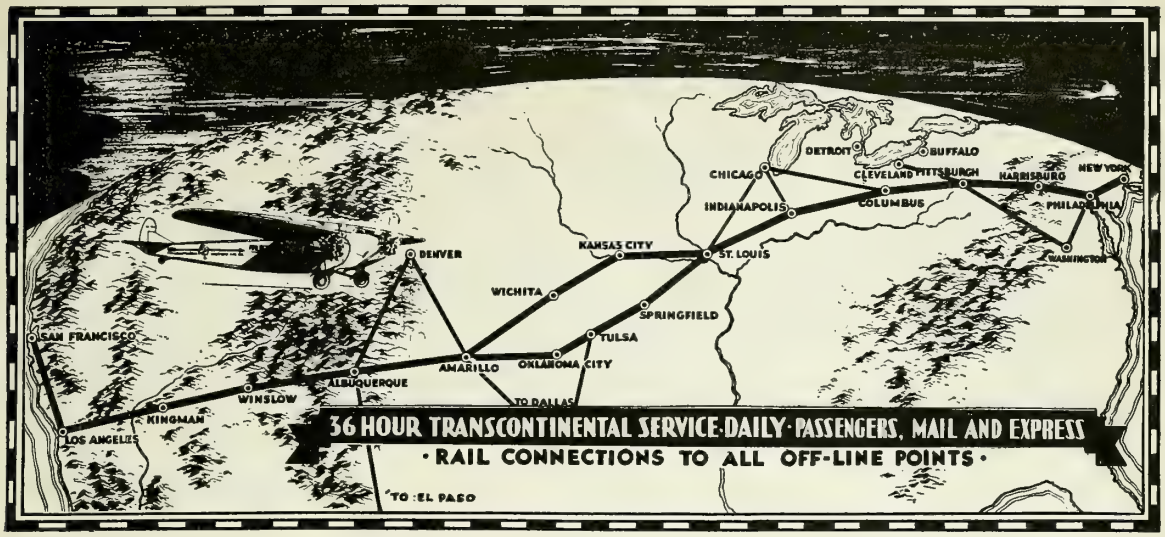
"Ran the usual run of things: R.A.F., B.E.F. with the 73rd., Camels. Visited the Hun for several months as a prisoner and then got the taste out of my mouth in Paris. Came back home and ate irregularly for a few years trying to run one-ship "Air Services"—99% air. Tried mail, and then grew desperate and tried even Charlie Levine. Still wondering which gave me the most gray hairs, Charlie or his famous non-start long-distance plane, *Uncle Sam*. After *Uncle Sam* I felt qualified as a full-fledged juggler.

"Then fell down a long flight of stairs and came up with the first signs of brains to date. Went with the best aeronautical illustrator in the country (Advt.). Now have the novel sensation of eating regularly daily. Also fly anywhere and anyhow in comfort these days, via the armchair route where the first liar hasn't a chance. Noted for but one thing: have done nothing of importance and done it well. Have but one great redeeming feature to recommend me as I say *adios* to the game, to wit: I never taught a woman to fly."

Thank you, Mr. Leyson, especially for your concluding words. You never did an endurance flight either, did you? Thank you again, Mr. Leyson.

HAMILTON MAXWELL became interested in the possibility of making photographs from an airplane back in 1911, in Australia, and would have made the first photographic flight in an airplane from Sydney, Australia, only the plane cracked up taking off. Major Maxwell, therefore, is not the first man to make a photographic flight in Australia, but the first man to crack up while he was starting off to make the first photographic flight in Australia. That is even more distinguished from the point of view of a reporter, who still, to this day, considers a crash the most important contribution of aviation to the nation's progress, as listed in the papers. However, Maxwell did get a first in something—he joined the R. F. C. and was the first civilian to be commissioned as a photographic officer in any of the Allied forces. He was in France in 1915 in charge of the Wing Photography and in 1916 in charge of a Brigade Photography. At the beginning of 1917 he was sent to England, promoted to major—a very lordly and exalted rank, as any lieutenant will testify—and put in charge of all photographic training of the British flying forces.

In 1919 he left the R. A. F. and in October was given the first contract for an aerial photographic survey that was ever given in this country. It was given by the New York Central Lines to make a map of Cleveland, Ohio. The price was $5,000. The work was never completed, due to lack of proper facilities, and Mr. Maxwell went to Canada to take charge of the photographic department for Colonial Bishop and Barker until he finally returned to the States, incorporated his own company, and has been going strong ever since. The company has 41 employees, has affiliated corporations in Central and South America, England, Australia and Canada, and last November had work ahead for several months. Mr. Maxwell has been flying on photographic work for eighteen years and has flown over 2,700 hours on that work alone. His most valuable contribution was a map of New York City which enabled New Yorkers to find the 125th St. Station of the New York Central. Previous to the publication of this aerial survey, the only way a New Yorker had to find 125th St. was to take a night boat to Albany and come down on the train.



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BANKING BY AIR

By Charles N. Cutter
Director, Maine Aeronautical Survey

Every aviation executive is searching for a payload which is light in weight and which becomes more valuable when transported by air. Four months ago Mr. Charles N. Cutter set out to determine the practicability of establishing an airline into the state of Maine. During this period of time considerable information has been gathered concerning the potential demand for air mail, air express and passenger patronage, which should prove valuable to an operator. But perhaps the most interesting service which could be rendered deals with the transport of bank clearing matter from Maine to Boston.

AT the present time the national banks and trust companies of the State of Maine clear the bulk of their out-of-town items through the Federal Reserve Bank at Boston either directly or through a correspondent bank. Letters are made up at the close of the business day and mailed to Boston where they are delivered on the first mail the following morning. Boston city items are cleared at the 10:00 a.m. clearing, and other clearing matter is started on the way towards its destination that same day from the Federal Reserve Bank.

In view of the comparatively short distance of 100 miles between the principal cities of Maine and Boston, it appeared possible that if a part of the clearing matter could be flown to Boston, where credit would be given on the same day as received at Maine banks, there would be one day's interest saved on the Boston letters. Accordingly, a study was made of the deposit time required by the Federal Reserve Bank and a schedule made up to allow the Maine banks all the time possible before collecting the letters.

It was found that checks in amounts of $100 or more would be credited up to 3:00 p.m. by the Federal Reserve Bank. This meant that a plane could leave Portland at 1:35 p.m.; Augusta at 1:10; and Waterville at 12:55, and deposits could be made at 3:00 p.m. at Boston.

A paper was read on the subject of "Banking by Air" to the Clearing House Associations in the Maine cities, and it was decided there was merit in the plan if the expense of air transportation would not overbalance the savings to be effected. Accordingly the cost of the service was ascertained, and the amount which could be included in the daily letters was checked by each bank to determine the practicability of the service.

While twenty-two banks were making their check-up, a return load from Boston of other express matter was discovered which would pay for about half of the operating expenses. The balance was to be paid for out of saved interest.

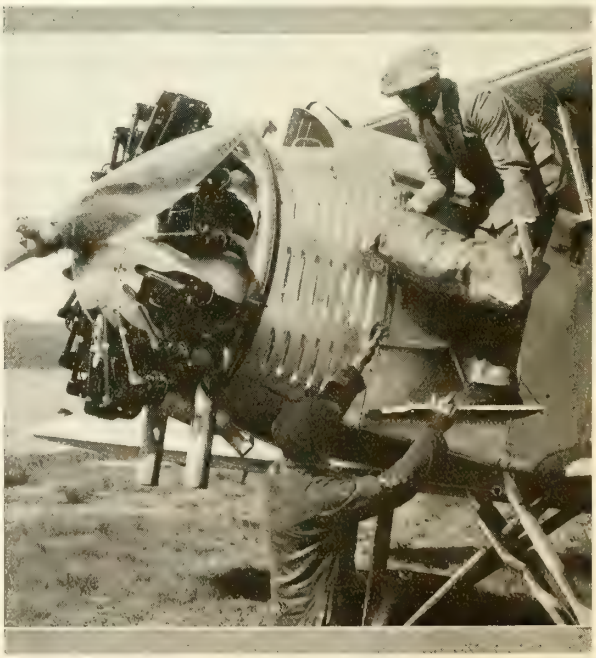
The amount of the daily letters which could be made up at 1:35 p.m. was estimated at $310,000. The interest saved was at first figured at the average loan rate but later fixed at the average return on the banks' funds. This varied from 4½ per cent to 5 per cent.

It was found after careful estimate that the revenue from the banks and return express load would adequately meet the operating costs. Provided the twenty-two banks availed themselves of the service, the average cost per day would be from $3.50 to $5.00 depending upon the amount of their letters.

The only objection offered by the bankers centered upon the safety of the checks in case of fire. "Would we be exercising due care with our patrons' paper?" they asked. Fortunately the Post Office Department has been conducting a study on prevention of mail loss by fire and has inaugurated the use of a container so constructed of steel and asbestos that the enclosed paper is not only protected from fire, but is not subject to charring or discoloration from the most intensely hot gasoline blaze. By applying the results of the department's research in this matter, it is believed the checks will be even safer than they are now. An additional safeguard has been taken by several Maine banks by the installation of recordak equipment which photographs each check for filing purposes.

It is hoped that this bankers' service can be started by April so that the experience in operating the line will extend over the most advantageous months. Furthermore, in the summer, Maine letters should increase considerably because of the great number of visitors and tourists.

From the aeronautical point of view, the bankers' express plan is interesting because it offers a new form of payload which does not require the elaborate and expensive attentions demanded by passengers. It allows a higher operating efficiency, since not as many trips will have to be cancelled because of unfavorable weather, and a payload which becomes more valuable because of faster transportation.



Unloading valuable cargoe from mail compartment of a Boeing

CURRENT AIRPORT AND AIRWAY FACTS

A NATION-WIDE network of radio ground stations went into operation recently when the twenty stations of Transcontinental and Western Air, Inc., were completed.

The stations, one at each of the cities served by the airline, will provide a continuous and rapid communication system from coast to coast as well as between the ground stations and planes aloft.

Radio code signals are used for all messages between two ground stations, and voice transmission for communications between planes and ground stations.

THIRTY-FOUR air transport lines reported a total of 28,833,967 miles flown in scheduled operations during 1930, or an increase of 42.4 per cent over 1929, according to figures compiled by the Aeronautical Chamber of Commerce of America, Inc. Miles actually flown during the year were 93.9 per cent of all miles scheduled.

In the seven per cent not completed, causes have been analyzed as follows: 91 per cent abandoned because of bad weather, 1.46 per cent because of mechanical difficulties, 6.44 per cent because of insufficient traffic, 1.1 per cent because of "other causes."

A marked decrease in the rate of passenger fatalities was evident in 1930. More than 3,900,000 passenger miles were flown for each passenger fatality.

A TOTAL of 96,933 persons, not including those carried on taxi hops, were carried in and out of the Tulsa Municipal Airport in 29,209 planes in the year 1930.

From its opening on July 3, 1928, to January 1, 1931, the Tulsa port cleared over 198,000 persons and 60,500 planes, without injury to a single passenger.

EXHIBITORS and visitors to the National Aircraft Show of 1931, which will open in Detroit April 11, will see the installation of more than $100,000 worth of improvements at the Detroit City Airport nearly completed. This sum has been spent in the construction of concrete aprons to the hangars, grading and landscaping, planting of trees in the parkway at the main entrance, and lighting.

The hangar at this airport which will houses the show is one of the largest in the world, having a show space of 200,000 square feet, and was built at a cost of a million dollars.

The 260 acres on which the airport is built comprises a land investment of $5,000,000 and the development as a whole, when completed, will be valued at $10,000,000.

THE erection of the largest neon aviation beacon in the United States on top of the Merchants Bank Building in Indianapolis by the Lincoln Oil Refining Company has been announced. Use of the roof for a period of ten years for the aviation beacon and airway marker has been contributed by John P. Frenzel, Jr., president of the bank.

The beacon will be of 2,000,000 candlepower and will be visible for about seventy-five miles.

THE four transport operators using Lambert-St. Louis Field handled a total of 1,477 passengers at that field during January. Transcontinental & Western Air, operating the coast-to-coast service with eight daily arrivals and departures at the airport, led with 686 passengers. Other companies using the airport are American Airways, Rapid Air Transport, and Robertson Air Lines.

AIR express service linking sixteen Eastern cities has been inaugurated through the association of the Colonial division of the American Airways, the New York, Philadelphia & Washington Airways, the Pittsburgh Airways and the Western Union Telegraph Company.

Pittsburgh Airways, Inc., will handle air express between New York, Newark, Coatesville, Greensburg, Harrisburg, Johnstown, Lancaster, York and Pittsburgh. To this system will be joined the air express service already established through collaboration between Western Union and Colonial between Boston, Newark and New York, and the service of the New York, Philadelphia and Washington Airways linking Newark, Trenton, Camden and Baltimore.

At the same time a reduction in rates is announced between New York and Boston, with the addition of Hartford as a regular stop. The rate between these points formerly began at $1.25 and scaled upward. The new rate between Boston, Hartford and New York is twenty cents a pound with one dollar for the first pound.

PROBABILITY of a collision of two two passenger planes flying at night has been reduced on planes of Transcontinental & Western Air, Inc., by the installation of a red spot light on the wings of all passenger and mail planes.

The red spot light has great penetrating power and can be seen for many miles by approaching pilots, according to Everett Drinkwater, superintendent of maintenance of the line, who designed the light.

A REDUCTION in air passenger rates over all its air transport units has been effected by the United Aircraft & Transport Corporation. A uniform rate of eight and three-tenths cents per mile was adopted on the first of the year.

The aim of the corporation, officials said, is to keep the fare as low as is consistent with good business practice but not to enter into ruinous rate cutting competition.

FOR ten consecutive months ninety-eight per cent of the miles scheduled to be flown by the Varney Air Lines, operators of mail, passenger and express service in the Northwest, have been completed. Over a million miles were scheduled and over a million were completed. Operations figures show that of the 1,071,364 miles scheduled, 1,047,292 were flown.

A COAST-TO-COAST air express service on a thirty-six-hour schedule and plans for its extension to world wide proportions through connections with steamship lines and foreign and domestic airlines, has been announced by Transcontinental and Western Air, Inc.

The service will begin immediately with express shipments moving on the schedules which now apply to the passenger and mail service on the mid-continent route between New York and Los Angeles. Transcontinental shipments in either direction will be flown to Kansas City the first day, remain there overnight and arrive at their destination the evening of the second day. The time for this service will soon be reduced to twenty-four hours when planes of the company begin night operations, thus eliminating the overnight stop at Kansas City.

THE results of a careful study of air traffic control problems are set forth in a preliminary report of the Committee on Airport Traffic Control of the Aeronautics Branch of the Department of Commerce, published in the December 15 issue of the Air Commerce Bulletin.

The Committee made a study of traffic conditions at American and foreign airports and conducted at the same time at Bolling Field, D. C., tests of various types of visual signaling units under both day and night conditions.

European airports were found in general to be more symmetrically operated as regards traffic control than American ports, because the former are in most cases a part of air transport systems, whereas American ports are generally municipally operated and serve for all types of flying.

Based upon studies of traffic flow on German airports, the commission has concluded that twenty-four plane movements per hour represent an airport's capacity.

DURING the month of December, 1930, planes of American Airways, Inc., transport subsidiary of The Aviation Corporation, flew 493,152 miles in scheduled mail and passenger service, and carried 123,770 pounds of mail and 1,622 passengers.

(*Continued from preceding page*)

DURING the next two months a National Air Transport mail plane equipped with the recently perfected B. F. Goodrich Company rubber "wing shoes" for the elimination of ice in flight will deliberately seek freezing conditions always avoided by airmen.

The coverings, built of special rubber and fabric, are moved by compressed air, and exhaustive tests in a refrigerated wind tunnel constructed by Goodrich in Akron, Ohio, indicate that the device will be successful in actual service.

NORTHWEST AIRWAYS has established a new international airport of entry at Pembina, North Dakota, to be used in the extension of service from St. Paul through Fargo, Grand Forks to Pembina.

This new airport contains 180 acres. It is one and one-half miles south of the town of Pembina, and two and one-half miles south of the international boundary.

Northwest Airways is building a hangar and administration building, the hangar to be 100 feet long and eighty feet wide.

The administration building contains seven sleeping rooms on the second floor, large waiting room, offices for customs inspection, a kitchen, dining room and living room.

DECLARED by experts to be a vast improvement over the old candle variety of light, an electric night wind current indicator, designed by D. M. Little, chief meteorologist, is in use at the Oakland, California, municipal airport.

Small, hydrogen-filled balloons are sent aloft nightly at observation stations to determine the velocity of upper wind currents, height of "ceiling" and other factors governing the safety of night fliers. Candles were formerly used in California to make the balloons visible, but were banned because of the danger of starting fires.

The device consists of a miniature parachute, made of cheesecloth, attached to the balloon. At the bottom of the parachute is suspended a small battery of two dry cells and a lamp. When the balloon reaches an altitude of about 15,000 feet, the cold causes the rubber to burst, and the parachute brings down the light obviating the possibility of the apparatus injuring a human being.

A CAPITAL investment of $115,068,500 comprises the financial foundation for 1,113 airports that were in use in the United States on January 1, 1931, according to a survey of airport investment made by the Aeronautics Branch of the Department of Commerce. In addition, these airports are proceeding with plans for improvements calling for a further expenditure of some $20,225,000.

WING LANDING LIGHTS

THE General Electric Company is producing a line of airplane wing landing lights designed to avoid parasitic resistance and to provide high efficiency of light transmission. The searchlight beam is controllable and the weight of the complete unit is approximately 7½ pounds.

Each light unit is made up essentially of a searchlight and an enclosing cover having a special glass lens. A complete installation includes two of these units, one placed in the leading edge of the port wing and the other in the leading edge of the starboard wing. The lights are so placed that there is no reflection from the propellers. The covers are dust-tight and weather-proof.

The special glass used is unusually strong, is efficient in transmitting light and does not deteriorate with age. The reflector is made of a highly-polished parabolic mirror with a silvered back. Each lamp is rated 420 watts, 12 volts and 35 amperes, using a storage battery or a generator for its electric supply. The operating mechanism is so arranged that the searchlight beam is controllable by the pilot in flight through an angle of 90 degrees from straight ahead to vertically downward.

The unit is designed to conform to the exact shape of the wings.



Photo by Curtiss-Wright Photo Division showing several airports on Long Island. In this view the most clearly visible are: Glenn H. Curtiss (North Beach), Holmes, Flushing, and Curtiss-Wright Valley Stream

FAMOUS FLIGHTS WITH THOMPSON VALVES

WHEN THE "QUESTION MARK" SET THE FIRST SIGNIFICANT REFUELING RECORD



(This advertisement is one of a series recalling historic airplane flights in which Thompson Valves were used.)

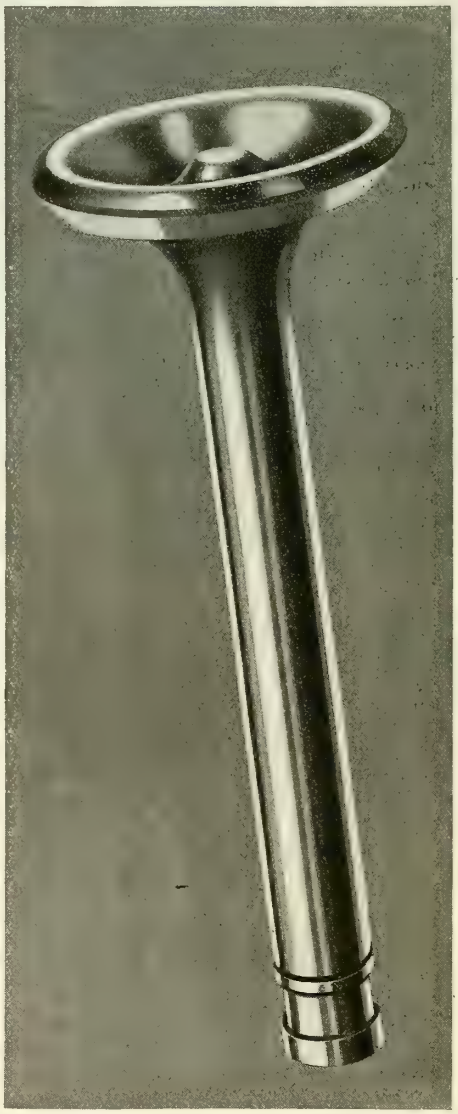
Refueling an airplane in flight was not an unprecedented feat in 1929. But its use to accomplish *the first refueling endurance flight in history* remained for Maj. Carl Spatz, Capt. Ira Eaker, Lieut. Elwood R. Quesada, Lieut. Harry A. Halverson and Staff Sergt. Roy Hooe, of the U. S. Army Air Corps.

Taking off in the tri-motored monoplane, "Question Mark," on New Year's morning, 1929, they flew for more than 150 continuous hours. All former heavier-than-air sustained flight records, including those of dirigibles, were exceeded by many hours.

It is significant that in this first aero motor "breakdown" test under actual flying conditions, just as in the first outstanding full-throttle block tests, Thompson Valves *stood up*. The 54 Thompson Valves in the three Wright Whirlwind motors of the "Question Mark" survived the terrific grind in condition capable of many more hours of flight.

This and many other famous demonstrations have influenced the adoption of Thompson Valves for America's finest airplane engines.

THOMPSON PRODUCTS, INCORPORATED
General Offices: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT



Thompson Valves

THE AIR SERVICES

VOTE FUNDS FOR NAVAL AVIATION

THE Naval appropriation bill providing $348,051,952 for the Navy Department was passed by the House of Representatives on February 13. The bill includes direct appropriation of $31,070,000 for the Bureau of Aeronautics. A total of $2,220,000 is provided for experimental work on all types of aircraft, $220,000 of which will be devoted to the development of high-speed heavier-than-air craft. The bill was then referred to the Senate.

WITH the aircraft carriers *Lexington* and *Saratoga*, planes and the airship *Los Angeles* important factors in both attack and defense, the annual winter maneuvers of the U. S. Fleet started on February 12 in the waters off Panama. The maneuvers will be completed April 3.

The *Los Angeles* was used with successful results to spy out "attacking" forces and to report their position from the air to scouting cruisers below, according to early reports of the maneuvers.

Major Royce Gets MacKay Trophy

MAJOR RALPH ROYCE, former commanding officer of the First Pursuit Group, will receive the 1930 award of the MacKay Trophy, the War Department announced on February 19, in recognition of leadership displayed when he led the "Arctic Patrol" from Selfridge Field, Mich., to Spokane, Wash., and return in January, 1930.

Major Royce is now serving as a member of the War Department General Staff, Washington, D. C.

APPOINTMENT of Capt. Arthur B. Cook, U.S.N., as Assistant Chief of the Bureau of Aeronautics, effective May 10, was announced recently by the Navy Department. Captain Cook will relieve Capt. John H. Towers, U.S.N.

MORE THAN the required number of hours aloft are put in by Col. C. C. Culver, fifty-eight years of age, and the oldest pilot in the U. S. Army Air Corps, according to a recent report. Colonel Culver was formerly commanding officer of Langley Field, Va.

THE Distinguished Flying Cross has been awarded to five naval officers for extraordinary achievements in aviation.

The awards were made to Lieut. Apollo Soucek for his record flights in high altitude experiments; and to Lieut. Wallace M. Dilson, Lieut. Richard F. Whitehead, the late Lieut. E. F. Burkett (the decoration being forwarded to his widow, Mrs. Martha Burkett), and Chief Radio Electrician Claude G. Alexander, for an aerial survey of Alaska made in 1926.

CONTRACTS for 1,629,000 gallons of Stanavo Aviation Gasoline were recently awarded by the Army Air Corps, according to a recent announcement of Stanavo Specification Board. Among the delivery points specified are the Government laboratories at Wright Field, Dayton, Ohio; Langley Field, Va.; and Selfridge Field, Mich.

Flying Boats for Submarines

TESTS of an amphibion which, with wings folded, can be fitted into a special tube on submarines, have been conducted at North Beach, Queens, L. I., by Grover Loening of the Loening Laboratories.

According to Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics, Navy Department, "the government is in no way obligated to purchase these craft, but the Navy Department is encouraging the experiments with this type of aircraft for the good of the service."

The flying boat which Mr. Loening is testing can be dismantled and stored in an eight-foot tube aboard a submarine. It has a wing spread of thirty-eight feet and is powered with a 110-horsepower Warner-Scarab engine. The cruising speed is said to be 100 miles per hour and the plane can be assembled or dismantled within a few minutes.



(Acme-P & A Photo)

Flight tests were made recently of this Curtiss fighter built for Navy Department

Third Attack Group Active

PLANES of the Third Attack Group, Army Air Corps, Fort Crockett, Galveston, Texas, flew a total of 167,815 miles during January, according to a recent announcement. The 13th Attack Squadron headed the list with a total of 553 hours; 90th Attack Squadron flew 533.30 hours; 8th Attack Squadron, 405.05 hours; and the 60th Service Squadron, 186.40 hours.

To Study Problems of Defense of Ground Troops Against Low Flying Enemy Aircraft

THE problem of equipping all field artillery pieces and machine guns with mounts capable of being elevated to a high angle of fire for defense against low flying enemy aircraft will be a subject of study by department chiefs upon direction of the Secretary of War, according to a recent announcement of the War Department. Pointing out that certain elements of the Infantry Division may be particularly vulnerable to attacks by low flying aircraft, the Secretary of War has called for definite recommendations as to what reorganization and rearmament are necessary to insure protection.

Anti-aircraft guns are practically the only defense ground troops have against attacking aircraft. Such defense is negligible against low flying planes because units of infantry marching to the front to operate against ground troops cannot carry anti-aircraft guns, or machine guns with elevated mounts as well as surface guns.

One solution is the development of an "all-around" gun capable of being used against surface or air enemies, the War Department announced, and such a gun has been developed by the Ordnance Department for experimental purposes.

Two experimental models are now in existence. Although not perfected as far as being able to do the work of anti-aircraft as well as surface guns, the principle of having a double purpose mount is considered sound where complex fire-control apparatus is not required. They are 75 millimeter guns on truck mounts. Considerable time is required to set them up, however.

Study of machine guns for general service use to serve against low flying aircraft and surface troops will be made. Field trains, transportation units, Engineer, Ordnance and Signal detachments will be equipped with these guns if the study deems it practical.

If the study results in the installation of mounts for field artillery guns to permit defense and attack against aircraft in addition to ground forces, they will not replace regular anti-aircraft guns because this feature would serve only an auxiliary purpose and would be effective only against low flying enemy aircraft.



BUILDING STAMINA INTO CHANCE VOUGHT AIRPLANES

To this inspection table comes every tubular part—and only perfect units ever pass it.

Welded into the engine mount and fuselage of every Chance Vought airplane are dozens of pieces of tubular steel. Rigid specifications fix the formula for the material. Careful inspection and tests of stock as it is received make certain that it meets requirements in strength, hardness, ductility and elasticity.

Then, when frame members are cut for assembling, after sand blasting to remove all dirt and grease, they pass to the inspection table shown above. Electric spinning and a high intensity inspection lamp equipped with magnifying lenses help skilled inspectors to spot the smallest flaw. And only perfect parts pass on.

There you have one of the basic reasons why Vought planes stand up in the rigorous service of the Navy and the Marine Corps. Launched from catapults . . . landed on surging steel decks . . . halted by relentless arresting gear . . . these airplanes, built in the modern Vought plant at East Hartford, thrive on hard service. Chance Vought Corporation, East Hartford, Connecticut. Division of United Aircraft & Transport Corporation.



CHANCE VOUGHT CORPORATION

Naval Aerological Stations

WEATHER data for naval aircraft is made available through naval aerological stations ashore and afloat. At the end of the past fiscal year, aerological stations afloat were in operation on seven aircraft carriers and tenders and on the *New Mexico, Arkansas* and *Pittsburgh.* Ten units were maintained ashore at naval aerological establishments and five with Marine Corps aircraft squadrons. Regular aerological flights were made at eleven stations.

Special study in gust structure and structure of the upper air, and investigations of weather conditions at prospective lighter-than-air bases is being continued. The use of temperature-entropy diagrams in forecasting has been increased and an improved ship type theodolite with an illumination system for night observations has been developed.

At the end of the fiscal year the aerological personnel of the Navy Department consisted of seventeen commissioned officers and forty-seven aerography ratings.

REAR ADMIRAL RICHARD E. BYRD and three members of the Byrd Antarctic Expedition were honored recently by the Navy Department. The Navy Cross was awarded to Rear Admiral Byrd as commander of the expedition, the citation particularizing the "hazardous flight" over the South Pole November 29, 1929.

Capt. Alton N. Parker, Marine Corps Air Service, was awarded the Distinguished Flying Cross for "extraordinary achievement as test pilot in a flight of the expedition which resulted in claiming new land for the United States." The Navy Cross was awarded Master Technical Sergeant Victor H. Czegha for "distinguished service" as a machinist for the expedition; and Gunnery Sergeant Kennard F. Bubier for "distinguished service" as an aviation mechanic.

The Navy Cross is the fourth award bestowed upon Rear Admiral Byrd, he having received the Congressional Medal of Honor and the Distinguished Service Medal for his North Pole flight and the Distinguished Flying Cross for his flight over the Atlantic.

THE section of the landing field on the eastern side of the railroad track, known as Field No. 1, Marine Barracks, Quantico, Va., has been permanently discontinued, according to a recent announcement of the Hydrographic Office. A drainage canal is being dug across the center of the field. All flying activities will be concentrated at the field on the western side of the tracks.

INTERESTING FACTS

THE first aviation unit in the National Guard was the First Aero Company of New York, mustered into service June 22, 1916. The company was composed of three officers and forty-two enlisted men under the command of Lieut. R. C. Bolling.

The first airplane flight from the deck of a United States vessel was made November 14, 1910, by Eugene Ely, a civilian pilot, who flew an airplane from a platform constructed on the bow of the *U.S.S. Birmingham.*

The first catapult designed for launching an airplane from the deck of a ship was constructed at the Naval Gun Factory, Washington, D. C., in 1912.

Navy Gets 20 Fledglings

DELIVERY of twenty Curtiss Fledglings to the Navy Department has been announced by the Curtiss Aeroplane & Motor Company. Provision on these ships is made for the installation of a variety of military equipment, including machine gun and bombing armament, radio and gun camera equipment. The planes are designated as the N2C-2 and each is powered with a Wright Whirlwind 240.

Air Corps Orders New Falcons

THIRTY improved-type Curtiss Falcons have been ordered by the Army Air Corps from the Curtiss Aeroplane & Motor Company, Buffalo, N. Y., according to Curtiss officials. The first of these ships is to be delivered to Mitchel Field, L. I., about the end of March.

Included in the improvements over the old style Falcon now in service at Mitchel Field is the installation of a rubber-tired tail wheel in place of a steel tail skid; and a gun mount on the rear seat that permits the observer to shoot without exposure to the slip stream.

Equipment Developed by Army Air Corps

INCLUDED in the experiments which have been made by the Army Air Corps are tests of a release mechanism for dropping tow targets, and a new type of gun camera for the training of pilots in the firing of machine guns upon other aircraft.

Two new types of release mechanisms designed to drop tow targets and to substitute new ones without rewinding the cable and manually attaching the targets have been developed for use with the standard B-9A target. The devices have no releases on the end of the cable. One was developed at Wright Field, Dayton, Ohio, and the other at Phillips Field, Maryland.

In the release mechanism designed at Phillips Field, a plunger backs up against a knot tied in the cable. When the other plunger slides down the cable it forces the first one open and the target is automatically dropped. The device designed at Wright Field is comprised of a steel bar with a latch at one end and a trip at the other. When the new target slides down the cable the trip is depressed by a ring forced over it. When the old target is released, the latch springs back catching the new target.

In the new type of gun camera tested by the Air Corps the gunner aims the camera as he would a gun, automatically making a picture which shows whether or not a hit would have been made if a gun had been fired. This gun camera is similar in size and shape to the Browning machine gun and may be mounted on a synchronizer gun mount. Stainless steel ball bearings are incorporated in the construction of this camera. The castings are made of bronze. The camera shoots a minimum of three pictures a burst.



(*P. & A. Photo*)

Loening amphibion which, with wings folded, can be fitted into special tube on board a submarine for regular operation

AERONAUTICAL INDUSTRY

DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

(Cuba.) Fastest trip ever made since it began service seven years ago was completed by the naval dirigible *Los Angeles* at the Naval Air Station, Guantanamo, Cuba, on a sun-down-to-sundown flight of more than 1,535 miles, covered in 24 hours and seven minutes at an average speed of 64 miles per hour. The flight was made to participate in the annual maneuvers of the U. S. Fleet. (Feb. 4-5).

Food flown from many sections of the country by scheduled planes was served at a luncheon of executives of the airlines using Newark Airport, officials of the airport and the City of Newark, N. J., to commemorate the completion of the Colonial Airways station at the field. (Feb. 4).

Pilots who established new records in aeronautics during 1930 were tendered a reception at the Willard Hotel, Washington, D. C., by the Washington Aero Club and the National Aeronautic Association. They were awarded certificates affirming their records. (Feb. 4).

(Chile.) Capt. Boris Sergievsky completed a 5,000-mile flight from Stratford, Conn., to Santiago, Chile, in a Sikorsky amphibion which he delivered to the Chilean government. (Feb. 5).

On a 'round-the-world journey by airplane and steamship, the Hon. Mrs. Victor Bruce landed at Glenn Curtiss Airport, North Beach Queens, L. I. Mrs. Bruce left London, England, September 25, flew to Japan, crossed the Pacific by surface vessel and flew across the United States. She plans to continue to Africa by steamship and complete the flight to London by airplane. (Feb. 5.)

Tests of a flying boat which, with wings folded, can be fitted into a special tube on submarines, indicate that the plane meets with the requirements of the Navy Department for regular operation, according to an announcement of David S. Ingalls, Assistant Secretary of the Navy for Aeronautics. The plane was built and tested by Grover Loening. (Feb. 5).

(England.) Continuing a 'round-the-world journey by airplane and steamship, Richard Halliburton, American author, took off from Hamble, Hampshire, in his plane, the *Flying Carpet*. (Feb. 10).

Reductions in air passenger transport fares of from eight to forty per cent over its airlines connecting the United States with twenty-eight Latin-American countries, were announced by Pan American Airways. The reductions were made to stimulate air travel between the United States, Central and South America. (Feb. 11).

Public demonstration of a "safety" plane designed by A. A. Merrill was given at North Beach Airport, Queens, L. I. The plane, which incorporates several principles of design intended to increase safety and to give a better general performance, was landed "hands off" by the pilot. (Feb. 11).

(England.) Miss Amy Johnson landed at the North London airport on a flight from Hanover, Germany, after abandoning at Warsaw an attempted London-Peiping, China flight. (Feb. 11).

(England.) A flight from London to Cape Town, South Africa, was started by Flight Lieutenant Tommy Rose in a single-place Hermes-Avian. (Feb. 11).

Preliminary flight tests of the Curtiss XF9, built for the Navy Department by the Curtiss Aeroplane & Motor Company, were conducted at Mitchel Field, L. I. The ship is a single-place fighter. (Feb. 12).

(England.) The Schneider Trophy Race will again be held over the waters of the Solent, between the Isle of Wight and Southampton, according to an announcement of the Air Ministry. The government will permit Royal Air Force pilots and planes to compete but will loan no money. It is reported that civilian interests will provide the funds necessary for the British government to enter the race. (Feb. 12).

(Panama.) The annual winter maneuvers of the U. S. Fleet started in the waters off Panama. Aircraft carriers and planes are important factors on both attack and defense and the airship *Los Angeles* will participate in one of the special problems incident to the fleet maneuvers. (Feb. 12).

Towed by a powered ship above New York City in a sailplane, Jack O'Meara cut loose at an altitude of 3,800 feet, soared above the city and returned to the North Beach Airport, Queens, L. I. The flight, made to test the air currents above New York's skyscraper buildings, was completed in about twenty minutes. (Feb. 12).

With direct appropriations for the Bureau of Aeronautics, Navy Department, totaling $31,070,000, the naval appropriation bill providing $348,051,952 for the Navy Department was passed by the House. The bill includes $2,220,000 for experimental work on all types of aircraft, $220,000 of which will be used in the development of high-speed planes. The bill was then referred to the Senate. (Feb. 13).

Corrective measures taken in naval airplane construction as a result of studies by the Bureau of Medicine and Surgery have practically eliminated the hazard of carbon monoxide filtering from the engine exhaust into the cockpit of a plane in flight, the Bureau of Aeronautics, Navy Department, announced. (Feb. 14).

To test the practicability of moving an air squadron at night under conditions of "blind" flight, nineteen planes of the Army Air Corps, completed a night formation flight from Selfridge Field, Mich., to Bolling Field, Washington, D. C. (Feb. 15).

Effect of the Watres air mail law upon the business of air mail operating companies since the law became effective was reviewed at a conference between the executives of twenty-six of these air mail companies, Postmaster General Brown and other officials of the Post Office Department, Washington, D. C. (Feb. 16).

(Cuba.) Attempting to establish a junior record for a flight from Newark Airport,

(*Continued on next page*)



The Detroit "News" has purchased Autogiro for use in news gathering activities

(Continued from preceding page)

N. J., to Havana, Cuba, and return, Robert Buck landed at the military aviation field at Camp Columbus, Havana, on the leg of the flight from Miami, Fla. He had previously landed at Miami after a thirteen-hour flight from Newark, making two stops en route. (Feb. 16).

Commemorative aeronautic meeting to honor the memory of Glenn H. Curtiss, Chance M. Vought and Daniel Guggenheim was held in the Engineering Building, New York City, under the auspices of the Aeronautical Chamber of Commerce, Society of Automotive Engineers, National Aeronautic Association and the societies of civil, mining, metallurgical and mechanical engineers. (Feb. 25).

Detroit *News* Will Use Autogiro in News Gathering Activities

FIRST production model of the Autogiro has been delivered to the Detroit *News* for regular use by the newspaper, according to a recent announcement of the Autogiro Company of America, Philadelphia, Pa. Among the activities in which the Autogiro will be used by the *News* will be the transportation of reporters and photographers to districts inaccessible by other means of fast transport; aerial photography under conditions believed otherwise impossible; and direct delivery of news matter from the air to the roof of the Detroit *News* building.

The machine is a three-place open-cockpit Autogiro powered with a 300-horsepower air-cooled engine.

Hawk's Log Shows 25,409 Miles Flown in Six Months

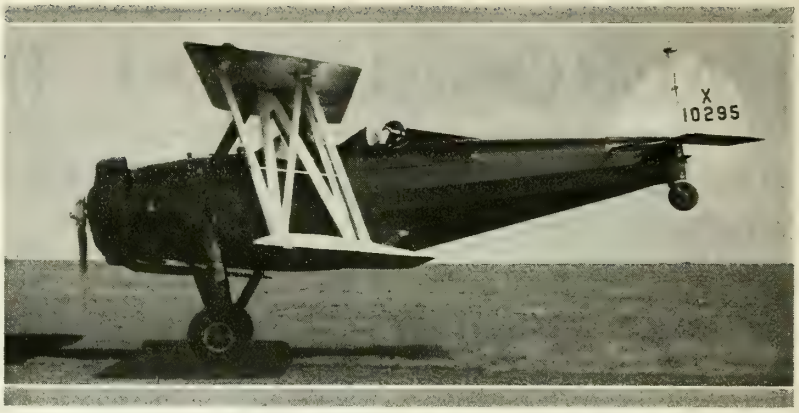
OFFICIAL log of the flights made by Capt. Frank M. Hawks in the Travel Air Mystery S monoplane *Texaco 13*, show that during a period of six months a total of 25,409 miles was flown in 136 hours and nineteen minutes of flight at an average speed of approximately 200 miles per hour. The first flight during this period was made on July 26, 1930.

The log shows a total of ninety-two flights, excluding a number of exhibition and test hops, but including fourteen records, two of which are for westward and eastward transcontinental time. Forty flights were made at an average speed of 200 miles or more; the fastest hop was 270 miles per hour and the slowest 145 miles per hour. Distance of the ninety-two flights ranged from fifty to 900 miles.

Captain Hawks is aeronautical advisor to The Texas Company.

Completes Flight in Sailplane Above New York City to Test Air Currents

AIR CURRENTS above the skyscraper buildings on the east side of Manhattan, New York City, were tested by Jack O'Meara on a flight made in a Bowlus sailplane on February 12. Because motorless heavier-than-air craft are more sensitive to air currents than powered planes, the flight was made to obtain additional data on the combination of up-currents produced by the buildings and the thermal currents from the city. It was found that these warm currents of air from the chimneys of power houses, factories and apartment buildings were much stronger than had been anticipated.



Merrill safety plane landing "hands off" controls in test flight

Towed by a powered plane piloted by O. Bevins, O'Meara took off at North Beach, Queens, L. I. The towing plane climbed to an altitude of 3,800 feet above the city before O'Meara cut loose from the 500 feet of cable. The sailplane circled above Manhattan and after losing an altitude of more than 800 feet, turned and started for the airport. An up-current of air over the East River carried the sailplane to an altitude of more than 4,000 feet. The craft returned over the airport at a height of more than 1,500 feet. The flight required approximately twenty minutes.

Permission for the flight was obtained from the Aeronautics Branch of the Department of Commerce. Additional sailplane flights for the purpose of testing the air currents above New York are planned.

Form Academy of Air Law

THE American Academy of Air Law, a national organization, has been formed as a medium for coördinating the efforts of organizations and individuals interested in the rational development of aviation and radio law, according to a recent announcement of Frank H. Sommer, dean of the New York University School of Law.

The academy is independent of the university, and any individual, educational institution, industrial or commercial organization interested in the development of a comprehensive national air law program may become a member on an equal basis, according to Mr. Sommer. The Academy will act as a national agency for scientific research and investigation of the phases of legal problems presented by aviation and radio.



(Acme-P & A Photo)

J. S. McDonnell, inventor of "fool-proof" plane tested at Washington, D. C.

Certificates Awarded Holders of World Flight Records Made in 1930

PILOTS who established aviation records in 1930 were tendered a reception by the Washington Aero Club and the National Aeronautic Association at the Willard Hotel, Washington, D. C., February 4.

Certificates affirming their records were given to the following: Barney Zimmerley, who established the world's altitude record of 24,074 feet for light airplanes; John and Kenneth Hunter, holders of the former world's refueling endurance record of 553 hours, 41 minutes and 30 seconds; Lee Shoenhair, for new speed marks for planes carrying 500 kilograms, at 185.452 and 171.228 miles per hour, and with 1,000 kilograms, at 175.997, 188.114 and 152.702 miles per hour; Miss Elenor Smith, who set the world's altitude record for women of 27,418 feet; and Miss Amelia Earhart, credited with a speed of more than 181 miles per hour to establish a new mark for women.

Commander E. E. Wilson, representing Capt. Boris Sergievsky, holder of several world's altitude and speed records with various loads, established in a Sikorsky amphibion (wheels removed); and Capt. John H. Towers, acting for Lieut. Apollo Soucek, holder of the world's altitude record of 43,166 feet for landplanes, accepted the certificates for them, the recipients being aboard.

Country Clubs Seaplane Cruise

THE First Annual Aviation Country Clubs Invitation Seaplane Cruise, sponsored by the United States Amateur Air Pilots Association, is scheduled to take place the latter part of June, according to a recent announcement of Charles L. Lawrance, national chairman of Aviation Country Clubs, Inc. Tentative plans cover a cruise of three or four days over a route along the Atlantic Coast.

Participation is limited to private owners of aircraft, who are members of Aviation

Country Clubs or of recognized yacht clubs.

The purpose of the cruise, Mr. Lawrance stated, is to provide the background for an annual gathering of amateur owners of water-flying equipment. The cruise will not be a race, no prizes will be offered and the schedule will be arranged so that all existing types of water-flying equipment will be able to participate.

A. S. M. E. Meeting at Baltimore

THE Fifth National Technical Aeronautic Meeting, organized by the Aeronautic Division of the American Society of Mechanical Engineers, will be held at Baltimore, Md., May 12-14. The conference is sponsored by the Engineers' Club of Baltimore, affiliated engineering societies and the Baltimore Section of the A. S. M. E. The program of activities will include inspection trips to local aircraft plants, ten or more technical sessions covering various phases of aeronautics and the annual banquet of the society.

Dr. Hugh H. Young has been appointed chairman of the advisory board which will supervise the activities of the conference. Temple Joyce is vice president of the board and Orville Wright is honorary chairman.

Aeronautics Branch to Conduct Study of Aircraft Engine Mufflers

AS a means of reducing airplane engine exhaust noises, a study of engine mufflers has been undertaken by the Aeronautics Branch of the Department of Commerce, according to a recent announcement of Harry H. Blee, Director of Aeronautic Development of the Aeronautics Branch. The active coöperation of manufacturers of engine mufflers and of other interested persons has been requested.

The study will be conducted by the Aeronautics Branch through its research division.

Curtiss-Wright Reports Increase in Activities During 1930

SALES of aircraft and engines by the Curtiss-Wright Corporation during 1930 totaled more than $18,000,000, according to a report of the company's activities recently made public. This is inclusive of domestic and foreign business with governments, commercial operators and individuals.

In the export field, Curtiss-Wright sales totaled more than $3,720,000 in 1930.

Orders on hand January 1, 1930, totaled approximately $10,000,000, in comparison with $12,000,000 on January 1 of this year.

Planes of the Curtiss-Wright Flying Service, which operates more than 400 planes at thirty different bases, carried 221,433 paying passengers, as compared with 1929 when 86,589 paying passengers were transported.

There were 2,481 new flying students enrolled in the Curtiss-Wright flying schools in 1930, and more than 1,000 students were graduated and licensed by the Department of Commerce.

Approximately 8,351,360 acres were mapped from the air over more than thirty states during the year; and more than 50,000 acres were dusted by the company's crop-dusting fleet of planes.

General Aviation Corporation Acquires Pittsburgh Metal Airplane Company

PURCHASE and control of the Pittsburgh Metal Airplane Company, a subsidiary of Pittsburgh Aviation Industries Corporation, by the General Aviation Corporation, a division of General Motors, Inc., has been announced by George R. Hann, president of the P. A. I. C. A meeting is planned to reorganize the personnel of the Pittsburgh Metal Airplane Company.

The Pittsburgh company will retain its present location and continue experiments with all-metal airplanes for commercial and military use, conducted by the present staff in coöperation with General Aviation Corporation. Experiments in the development of lighter weight aluminum for aircraft will be carried out in conjunction with the Aluminum Company of America.

Announce Changes in Executive Personnel of North American Aviation, Inc.

CHANGES in the organization of North American Aviation, Inc., were announced February 17 by C. M. Keys, chairman of the board.

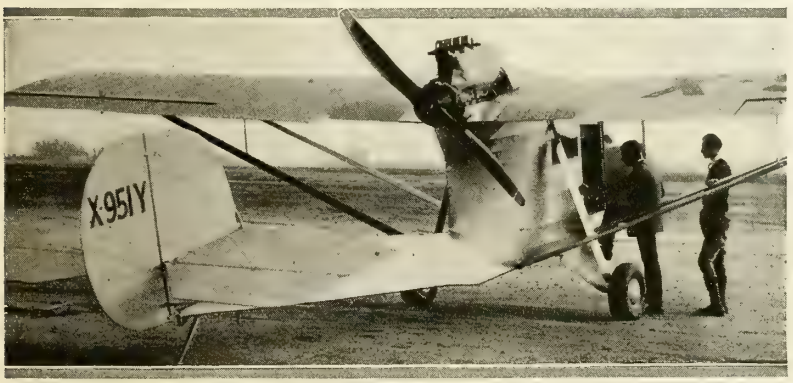
"Because of the very large amount of executive work to be done, it has become necessary to enlarge the official structure of North American Aviation, which has been almost unchanged since organization," Mr. Keys said.

Thomas A. Morgan, president of Sperry Gyroscope, Inc., has been elected president of North American Aviation, succeeding Mr. Keys who continues as chairman of the board.

A new position, vice chairman of the board of directors, has been created, and J. Cheever Cowdin, formerly senior vice president, has been elected to fill this office, becoming assistant chief executive officer.

Captain Thomas B. Doe, president of Eastern Air Transport, Inc., and formerly a vice president of North American Aviation, was elected first vice president.

The volume and scope of the business of Sperry Gyroscope, Eastern Air Transport and Intercontinent Aviation and the company's other properties have materially increased during the last two years, according to Mr. Keys and growing activities of the subsidiary companies have made the personnel changes necessary.



(Acme-P & A Photo)

Pusher monoplane designed by Earl E. McClary of Huntington Park, Calif.

American Cirrus Engines Resumes Production at Marysville

ENTIRE assets of the American Cirrus Engines, Inc., have been purchased by a group of Chicago business men, headed by Lee Hammond, and production of the Cirrus aircraft engines will be resumed at the plant at Marysville, Mich., according to a recent announcement of company officials. A sales policy of direct distribution to the trade has been adopted and a number of regional service stations throughout the country will be established. Officials of American Cirrus Engines, Inc., include W. R. Blacklock, general manager; Farr Nutter, sales director; W. W. Finlay, factory superintendent; and Walter E. Berger, service manager.

Curtiss-Wright Announces Personnel Changes in Organization

WALTER L. AVERY, formerly manager of Curtiss Airport, Valley Stream, N. Y. and of Curtiss-Essex Airport, Caldwell, N. J., has been appointed by Major E. H. Brainard, president of the Curtiss-Wright Flying Service, as manager of all photographic flying.

K. S. Lindsay, formerly manager of Curtiss-Steinberg Airport, East St. Louis, has been appointed manager of Curtiss Airport, Valley Stream, L. I.

The Curtiss-Wright Flying Service base at Buffalo, N. Y., has been discontinued. Mr. Emrick, manager, has been transferred to Kansas City as base manager.

Elect Valspar Officials

AT the annual meeting of the stockholders of the Valspar Corporation, manufacturers of varnish, lacquers, and paint, directors and officers were elected.

Directors elected are as follows: F. W. Davis, chairman; L. V. Pulsifer, A. W. Erickson, H. S. Boutell, H. T. Crane, J. F. McClelland, R. E. Allen, S. M. Koplar, Lawrence Phillips, H. G. Reed and Leonard Mould.

Officers elected are as follows: chairman of the board, F. W. Davis, Jr.; president, Lawrence Phillips; vice president, T. R. Wyles; vice president, H. S. Boutell; vice president, S. M. Koplar; vice president, Leonard Mould; secretary, L. Allen Osborne, Jr.; treasurer, Lawrence Phillips; and assistant treasurer, L. H. Roper.

PARKS DISCUSSES COMMERCIAL FLYING OF THE FUTURE

THE aviation industry and allied activities will be the first to recover from the general business depression in the United States, and the present year will be one of marked progress in aeronautics, Oliver L. Parks, head of Parks Air College and chairman of the Flying Schools Committee of the Aeronautical Chamber of Commerce, predicts in a recent study of the aviation industry and general business conditions.

"All major industries will show a slow and gradual improvement during the year," Mr. Parks said, "but the aviation industry in a new era of development will be greater than all developments the industry has undergone in the past thirty years. This year will present the greatest opportunity for those who would enter the profession."

Ninety-five per cent of those engaged in the aviation industry believe that the future progress of the industry will be definitely in the direction of scheduled air transportation, Mr. Parks said. He believes that scheduled operations will succeed because it is the fastest and will be the cheapest means of transportation.

However, the maximum number of air transport passengers can be obtained only through a drastic reduction in fares. Such reduction is possible by using a plane with a cruising speed of 200 miles per hour and an operating cost of two cents per passenger mile.

A six-passenger, high-wing cabin monoplane, powered with a 220-horsepower liquid-cooled engine and streamlined would meet the demand for such a plane, Mr. Parks said. The projected plane would be similar in design to the streamlined high-wing monoplanes powered with 400-horsepower engines, which are now in use. These ships cruise at about 135 miles per hour and have an operating cost of about four cents per passenger mile. The difference in speed and operating cost between these ships and the plane suggested by Mr. Parks would be made possible by better streamlining and a new type propeller, he said.

He suggests a liquid-cooled engine because the nose of the ship could be streamlined to reduce parasitic resistance to an absolute minimum; a plane powered with air-cooled engines, he pointed out, must necessarily have a blunt nose and therefore greater resistance. The new type propeller, Mr. Parks said, can be designed with a pulling power three times as great as the present type.

Wilson Heads Chance Vought

E. E. WILSON was elected president of the Chance Vought Corporation at a meeting of the board held recently in the offices of United Aircraft & Transport Corporation, New York City. He succeeds F. B. Rentschler, who becomes chairman of the board. Mr. Wilson, who recently resigned as president of the Hamilton Standard Propeller Corporation, is also president of the Sikorsky Aviation Corporation. All of these companies are subsidiaries of United Aircraft & Transport.

F. W. Neilson, formerly sales manager of Sikorsky, has been elected vice president of that company.

Ford Develops Trimotors

DEVELOPMENT of trimotor transport planes will be the major aeronautical activity of the Ford Motor Company, and the manufacture of this type of plane will be the principal work at the Ford Aircraft factory, Dearborn, Mich., according to a recent announcement of W. B. Mayo, head of the company's airplane division.

PORTABLE mooring masts have been added to the equipment of ground crews on airship operations by the Goodyear Tire & Rubber Company, Akron, Ohio. These masts are designed for use at places where there are no hangars available.

BECKWITH HAVENS, reported the U. S. Navy's oldest aviator in years of flying, recently joined the staff of the Vacuum Oil Company as special representative. Havens entered aviation in 1910 as the first airplane salesman of the Curtiss Exhibition Company.

Purdue Given Airport Site

THREE tracts of land totaling 157 acres have been presented to Purdue University, Lafayette, Ind., by David E. Ross, president of the board of trustees, for the development of an airport. The site is one-half mile from the campus and is adjacent to land owned by the university, giving a combined tract of 317 acres for the future development of the field.

VAUGHAN B. CONNELLY, former advertising and business manager of the *Aeronautic Review,* recently filed suit against the National Aeronautic Association, of which Senator Hiram Bingham of Connecticut is president, to recover $2,343.89 which he alleges is due him as commissions. Through Attorneys Syme & Syme, New York City, the plaintiff submitted a letter from Frederick R. Neely, former general manager of the publication, which purports to set out the terms of Mr. Connelly's employment which began March 5, 1929 and terminated on March 5, 1930.

COMING AERONAUTICAL EVENTS

March 25-27. Third National Airport Conference, Mayo Hotel, Tulsa, Okla.

April 11-19. International Aircraft Show, Detroit, Mich., sponsored by Aeronautical Chamber of Commerce and Aircraft Bureau, Detroit Board of Commerce.

May 15-31. International Aero Exhibition, Stockholm, Sweden.

May. Annual maneuvers of Army Air Corps along Atlantic Seaboard.

Mary 12-14. Fifth National Technical Aeronautical Meeting, A. S. M. E., Baltimore, Md., sponsored by Engineers' Club of Baltimore.

May 23. Dedication of Floyd Bennett Field, New York, N. Y.

June. First Annual Aviation Country Clubs Seaplane Cruise, sponsored by Amateur Air Pilots Association, on Atlantic Coast.

August 23-Sept. 1. Tentative date of National Air Races, Cleveland, Ohio.

NEW ENGLAND

Curtiss Base at Twin-State Airport

A BRANCH of the Curtiss-Wright Flying Service base, Hartford, Conn., will be established in the near future at Twin-State Airport, White River Junction, Vermont, according to a recent announcement of Clark Withers, manager. Flying and ground school instruction, sight-seeing and cross-country charter flights and aerial photographic services will be maintained at the field. A three-place Curtiss Robin cabin monoplane and a Gypsy-Moth two-place open-cockpit biplane will be used. The ships will be provided with skis for operation on snow and ice. Robert S. Hart will manage the base.

Develop New Airport

CONSTRUCTION of the first unit at the Massachusetts Air Terminal and Arena, a 1,300-acre airport situated twelve miles from Boston at Norwood, Canton and Westwood, is progressing rapidly. On April 1, flying operations are scheduled to start on a part of the field, which will be provided with four runways, each 2,500 feet long and 500 feet wide; a hangar 80 feet by 100 feet; and an administration building containing general offices and waiting room.

Construction work on the major terminal will not begin until conditions become crowded on the first unit, which will later be used as a student-training area, according to present plans.

Aeronautic activities at the field are under the supervision of Robert S. Fogg, aeronautics adviser of Massachusetts Air Terminal and Arena, Inc.

Extend Boston Airport

CONTRACT for filling approximately eighty additional acres to the southeast of the existing Boston Municipal Airport was recently awarded by the City of Boston at a cost of $129,500. The work will be completed in the spring.

WACHUSETT Airways, Inc., of Fitchburg, Mass., with headquarters at the Leominster, Mass., airport, has been appointed distributor for the Sikorsky Aviation Corporation in Maine, New Hampshire, Vermont, Rhode Island and Massachusetts

NEW YORK

AN ASSEMBLY plant will be established at New York City Airport, New York, by the American Eagle Aircraft Corporation, Kansas City, Kan., according to a recent announcement of E. E. Porterfield, president of the company.

Plan Air Meet and Show

PLANS for an air meet and aircraft exhibition at Binghamton, N. Y., May 8-10, were announced recently by the Bighamton Airport Company, sponsors.

W. J. TIMBERMAN, JR., has been appointed promotional supervisor of the Avileo Airplane Corporation, New York, N. Y. The Avileo company is the sole licensee for all aircraft designs and patents of Liore-Olivier of France and plans to license several manufacturers in the United States to build Liore-Olivier flying boats and amphibions.

A NEW floodlight has been developed by the General Electric Company, Schenectady, N. Y. The light was designed for floodlighting small airports from one point; for floodlighting larger airports, or airports with shifting wind directions, from two or more points; and for the lighting of any large area where a narrow vertical spread and a wide horizontal spread of the light are desired.

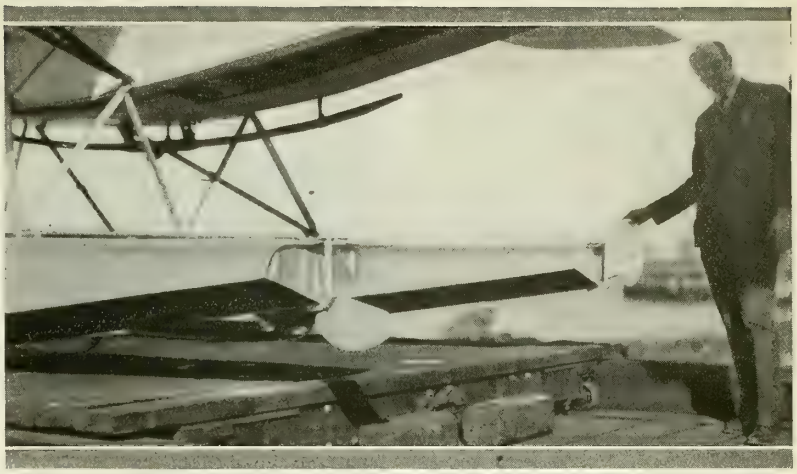
Parabolic, cylindrical glass mirrors with straight-line focus, and high-efficiency Mazda lamps with concentrated filaments, are provided. The units are enclosed.

CENTRAL NEW YORK

[M. MARVIN]

THERE has been a considerable amount of interest in flying activities during the winter at Bennett Field, Binghamton, N.Y. Fifteen students have been taking flying instruction. Among the construction work recently completed is a new wood and steel hangar which accommodates twelve planes.

A new ground school was recently organized at the field with a membership of fifteen students.



View showing water-rudder installation on Edo floats

Donald Woodward Airport

WITH a membership of 105 students, including 98 men and seven women, an aviation ground school was recently organized at the Donald Woodward Airport, LeRoy, N. Y. The class is supervised by H. A. "Tim" McKay, a Government approved instructor. Class lectures and practical demonstrations in the overhaul of a Wright Whirlwind 300 have been given members of the ground school by George Langille.

The D. W. Flying Service, Inc., which operates an approved flying school at the airport, also distributes aircraft and accessories, maintains an aircraft servicing department and conducts sight-seeing tours. Russell Holderman, manager of the Donald Woodward Airport, is president of the D.W. Flying Service, Inc.; H. Kirk Tennant is secretary, and J. Leonard Heemlick is treasurer.

SECOND year of operation was started recently by the Colonial aviation ground school, Utica, N. Y. Classes are held twice weekly over a period of twelve weeks. The school supervises ground instruction for the Utica Flying Service and the Wright Flying Service, both of which are located at the Utica Airport, according to Leroy S. Davis, manager of the Colonial school.



Monocoupe powered with a 90-horsepower Lambert engine and equipped with Edo floats

NEW JERSEY

SWITLIK Parachute and Equipment Company, Trenton, New Jersey, has been awarded a contract for 4,500 parachute seat pack assemblies and 6,000 tow targets and other spare parts by the Army Air Corps. The contract involves more than $60,000.

[F. FITZPATRICK]

EASTERN AIR TRANSPORT has two Curtiss Condor biplanes on the New York-Washington line. An innovation goes with these ships—each carries a hostess to entertain passengers.

WEEK-END service between Philadelphia and Atlantic City has begun at Central. Beginning early in April, Ludington officials have announced, the regular hourly service will be instituted.

A green flashing auxiliary beacon has been installed at Central by General Electric.

Expand Newark Airport

IT has been decided that forty acres of land adjoining the eastern side of the field at Newark Airport will be added to the landing area. This will give the field an oblong all-way landing field with two runways nearly 5,000 feet long. A $250,000 administration building and passenger terminal is to be built at the field.

PENNSYLVANIA

GEORGE H. PRUDDEN, aeronautical engineer since 1911, has been put in charge of all metal design and development at the Keystone Aircraft Corporation, Bristol, Pa., according to an announcement by Edgar N. Gott, president.

ORGANIZED as an engineering and manufacturing service to supply aircraft manufacturers with special construction data and parts for Autogiro aircraft, the Autogiro Specialties Company has started operations at Philadelphia, Pa.

(*Continued on next page*)

PHILADELPHIA

[R. GARD]

WORK on the new Hog Island airport site was recently begun. Mayor Mackey and other city officials participated in the ceremonies preliminary to the beginning of the work.

A NEW hangar has been completed at Wings Port, one of the newest airports to be developed in the Philadelphia area.

The Wings Corporation, distributors in this territory for Waco and Stinson planes, operate the field. Before the hangar had been completed seven ships and three gliders had been stored in a temporary hangar and gliding activities had already begun.

JOHN C. HADDOCK, an official of a coal concern at Wilkes Barre, Pa., recently purchased a PCA-2 Autogiro from Pitcairn Aircraft, Inc. He plans to use the ship to advertise anthracite coal. The ship will be delivered some time in April.

PITTSBURGH

[BOB COATES]

REDUCTION in air transport passenger fares between Pittsburgh and Cincinnati have been announced by the Main Aeronautics Company. Cost of the one-way trip is now $20.

THE DEPARTMENT OF PUBLIC WORKS has announced that the new $3,000,000 municipal airport will be in complete operation by June 1. The slag base surface is nearly completed and the work of spreading the bituminous surfacing will be started as soon as weather permits. Designs of three new buildings, a hangar, an auxiliary building and the administration structure, have been completed. The cost of these buildings will be $225,000. The contract for the lighting system will represent an outlay of $50,000. Drains are nearly completed. The South Pittsburgh Water Company is installing water lines. Two roads leading to the port are paved and the State Highway Department has another under contract.

THE PITTSBURGH CHAMBER OF COMMERCE has asked the county commissioners to name a commission or board to take charge of the new municipal airport.

OHIO

[T. E. LUNSFORD]

New Company Formed

INCORPORATION papers have been issued by the Secretary of State to Miller Airways, Inc., Put-in-Bay. The company is authorized to issue 250 shares of no par value stock. The incorporators are L. B. Mueller, M. Brown, L. Feldstein and John S. Brumback.

Designing Heated Flying Suit

WHILE awaiting completion of the specially built Waco plane in which she will attempt to establish a new altitude record for women, Miss Frankie G. Renner is designing an electric heating system to be used on the flight. Instead of the customary electrically heated flying suit, she plans to wear individual electric heating pads in her suit, mittens and moccasins, each of which can be controlled by a separate switch.



Cabin interior of Towle amphibion

Air Mail Contract Signed

CONTRACT between the Post Office Department and Parker Airways, Sandusky, Ohio, for delivery of mail to Lake Erie Islands has been announced to take effect next December for a four-year period. The airways company bid $10,900 a year.

Cut Air Passenger Fare

FARE reduction of $2.50 in air passenger rates became effective February 16, between Cincinnati, Indianapolis and Chicago. The reduction was announced by the Embry-Riddle division of the AmericanAirways, Inc., covering the Middle West.

MISSOURI

MAJ. ALBERT BOND LAMBERT has been named chairman of the St. Louis Chamber of Commerce Air Board, St. Louis, Mo.; and George B. Logan has been appointed vice president of the board.

ST. LOUIS

[T. P. WAGNER]

H. S. DARR has been appointed manager of Curtiss-Steinberg Field, Port St. Louis, Ill., the 569-acre base of the Curtiss-Wright Flying Service in St. Louis. He succeeds K. S. Lindsay. Mr. Darr has been affiliated with aeronautics since 1917, engaging in both military and commercial phases.

Universal Reduces Fare

REDUCTION in fare from $20 to $16.50 between St. Louis and Chicago became effective February 15 on Universal Airlines. A proportionate fare reduction was also made to Springfield and Peoria.

A morning plane was added to the service, which now offers three round trips a day. The new schedules are arranged to enable business men to make one-day trips between St. Louis and Chicago.

LIEUTENANT WELD is selecting college men for training as naval aviators at Pensacola, twenty candidates to be chosen from St. Louis.

Air Reserve Activities

SQUADRON VN-12, the St. Louis Naval Reserve Air Unit, is ready for a busy spring and summer flying program. The squadron has four ships in service and a staff of navy mechanics on the job under Lieut. Frank Weld.

Lambert-St. Louis Field Traffic

AIDED by good flying weather, airlines stopping at St. Louis reported good business during January. A total of 1,477 passengers were handled on scheduled trips out of Lambert-St. Louis Field. The number included 686 persons over Transcontinental & Western Air, 350 over Universal Airlines, 223 by Rapid Air Transport, and 218 on the Robertson line to New Orleans.

THE new lighting equipment at Lambert-St. Louis Field has received its final test and has been accepted by the city. The equipment includes a Sperry floodlight and various field markers and indicators.

MICHIGAN

Ex-Cell-O Sales Conference

SEMI-ANNUAL sales conference of the Ex-Cell-O Aircraft and Tool Corporation was held at Detroit, Mich., Feb. 5-7.

Phil Huber has been promoted to vice president and assistant general manager of the company.

Foreign Sales of Mead Gliders

SALES of glider kits by Mead Gliders, Chicago, Ill., to the following were recently announced by the company: Western Air Service, Perth, Australia; P. Casebourne, Doom Doona, India; and G. Miedecke, Apia, Samoa.

Detroit Servicing Facilities

ESTABLISHMENT of new service and repair stations at the Grosse Ile hangar and at the main factory in Detroit has been announced by officials of the Detroit Aircraft Corporation, Detroit, Mich. Owners of Lockheed, Ryan, Eastman and Parks aircraft and Detroit Gull gliders may secure servicing of their equipment at the new stations as well as at the factory branch in Burbank, Calif.

Detroit Aircraft Sales

GROSS sales of products of the Detroit Aircraft Corporation for January totaled $78,000, according to a recent announcement of Karl S. Betts, general sales manager. Sales of Lockheed and Ryan planes comprised the greater part of the total.

[J. M. HILL]

State Reduces License Fees

LOWER license fees for flying schools and airports have been approved by the Michigan board of aeronautics as a means of encouraging development of the industry. The board held that safety was the primary objective of its regulatory work.

The fees approved by the board were $10 yearly for transport, limited commercial, private and ground schools, instead of $100 for transport, $50 for limited commercial,

and $10 for private and ground schools, which had been in effect. Reductions in license fees for airports and airport managers were also adopted.

The board also decided to require a license for flying clubs, which previously were exempt.

New Flying Schools

APPLICATIONS for licenses to operate private flying schools have been made to the Michigan board of aeronautics by the B. & B. Flying School and the Aeronautical Schools, Inc., both of Detroit. The Overcashier Flying School, also of Detroit, has changed its name to the Detroit Aviation School and will operate a private pilot school in addition to the ground course.

To Propose Airport Aid

JOINT resolution seeking a referendum in April amending the Michigan constitution to permit the state to establish and to aid in establishing airports, is awaiting action in the legislature at Lansing. The resolution was introduced as a result of recommendations made by the state board of aeronautics.

NATIONAL AIRWAYS, INC., transport flying school of Detroit, has been reorganized under the name of National Air Service and will continue to operate as a transport school. Gerald Black, A. W. Reeves and H. H. Strickland head the organization. The company operates the National Airways airport.

WISCONSIN

[W. SCOLLARD]

MIDWEST AIRWAYS, INC., operating at the Milwaukee County Airport, has taken over the school program of Weeks Aircraft Corporation, which has transferred its activities to Charlotte, N. C. The Midwest concern will complete the instruction of students enrolled in the Weeks' school.

RECEIPT of a contract from the U. S. Navy Department has been announced by Harry M. Swigart, president of the Oilgear Company, Milwaukee, Wis. The contract covers hydraulic variable speed drive equipment, used in training and retracting catapults used for launching airplanes from ship decks.

FIRE recently destroyed six airplanes, one glider and other property of the airport at Kenosha, Wis.

THE new Federal weather bureau at the Milwaukee County Airport went into service February 1 to furnish reports to airlines and other pilots operating in and out of Milwaukee. J. P. Maltry, assistant at the Milwaukee weather bureau, has been placed in charge, assisted by Max Seinsilber.

The bureau will operate on a 24-hour schedule, making its own weather maps and reports. Telegraphic reports from points over the United States will be relayed by a direct telephone wire from the downtown Western Union office.

IOWA

[R. W. MOORHEAD]

FORTY-ONE students in Roosevelt High School, Des Moines, have petitioned the superintendent of schools to establish an aviation class at the school starting the second semester. A class in aviation, recently authorized at East High, will be an experimental one conducted to discover the best methods of supervising such a project and the best materials and books for this work.

According to the school board, a policy of extending the opportunities for studying aviation will be given all local high schools as soon as the technique for conducting such work has been sufficiently developed in one center. The board plans to proceed slowly so that the real value of the subject may be available to the students.

TEXAS

[C. MORRIS]

IMPROVEMENTS totaling nearly $300,000 are included in the 1931 program at Love Field, Dallas. Construction is now under way on a drainage system which will be immediately followed by the building of a hangar, costing between $75,000 and $100,000, by National Air Transport. A concrete hangar extending the length of the hangar crown is to be built soon and a three-story hotel will be erected during the year at a cost of approximately $175,000.

LEE SANDERS has succeeded Lee Garner as division manager of Southern Air Fast Express at Big Spring. He was formerly division manager for American Airways, Inc., at Atlanta.

AN airplane taxi service has been inaugurated at Wichita Falls, Texas, by H. Murphy Stuart. Equipment is a five-place Fairchild cabin plane powered with a 225 horsepower Wright Whirlwind engine.

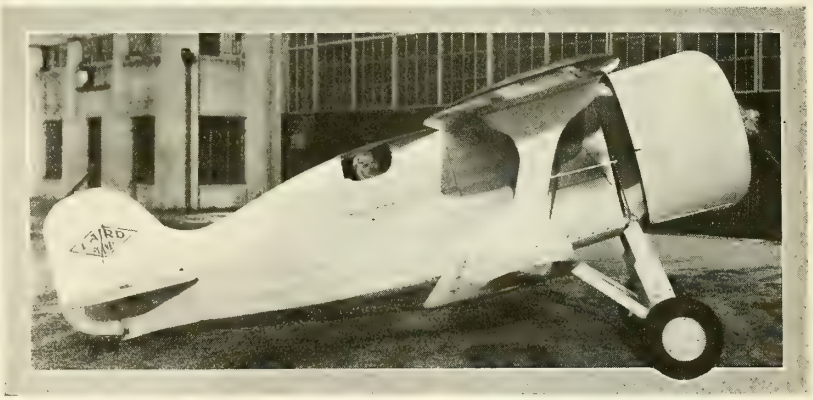
AUTREY MONSEY, manager of the San Angelo municipal airport, has announced plans for a ground training course in engine and airplane mechanics.

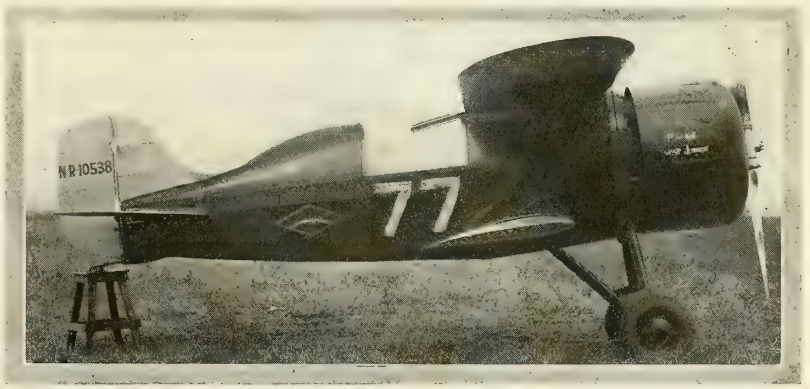
MIDLAND AIRPORT, Midland, Texas, has been incorporated with a capital stock of $50,000 by W. H. Sloan, Lee Jones, Jr., and A. F. Bowden.

BROWNSVILLE Municipal Airport, owned and operated by the City of Brownsville, has received an A-1-A rating from the Department of Commerce.

THREE steel hangars will be constructed at Duncan Field, San Antonio, the bids to be awarded as soon as plans are completed. This will be a part of the $500,000 building program at the air depot.

EARLY in January $80,000 was appropriated by Congress for the construction of two wings to the Randolph Field Academic Building, the center section of which is practically complete. The entire building is to cost $250,000.





(Below) Wasp Junior Laird which won Thompson Trophy Race at National Air Races with speed of 201.91 miles per hour and (above) same ship remodeled and streamlined

LOUISIANA

[C. COCK]

FIRST bids for construction at Barksdale Field, the base of the Third Attack Wing of the Army Air Corps, will be received by Captain George E. Lamb, Construction Quartermaster, at Shreveport on March 5. This work is for a quartermaster warehouse, maintenance warehouse and garage. An appropriation of $3,641,000 made by Congress is expected to be available shortly. Conditioning of the landing field, which will have an area of 10,000 acres, has been started, the first contract for 100 acres having been awarded the La-Tex Construction Company at $6.70 per acre. Contracts for this work will be awarded in portions of approximately 100 acres each.

As rapidly as architectural plans for buildings at the field are completed by the War Department they will be turned over to Captain Lamb for bid taking. The first three buildings will cost approximately $100,000.

AKERMAN MONOPLANE

By R. McKEE

A MONOPLANE powered with an engine mounted in the fuselage aft of the cockpit has been designed and built by John D. Akerman, professor of aeronautical engineering at the University of Minnesota. Mr. Akerman is the designer of the Hamilton all-metal plane.

A side-by-side seating arrangement is provided. A sliding door in the side of the fuselage facilitates entrance to and exit from the cockpit. The engine is installed in the fuselage to the rear of the cockpit, slightly aft of and below the wing. A pusher type propeller is provided.

The framework is all-steel covered with aluminum. The landing gear is attached directly to the fuselage. The plane is equipped with Airwheels and a tail wheel.

Powered with a forty-five horsepower engine, the plane has a high speed of eighty-five miles per hour.

Mr. Akerman plans to dispose of the manufacturing rights of this ship.

CONTACTS

By FRANK E. SAMUELS

CAPT. C. A. MacKENZIE, associated with Capt. Robert Kilso, has taken over the flying school department of the American Airport on Angeles Mesa drive.

ROBERT A. TROW, formerly manager of the aviation department of the Behrendt-Levy Insurance Corporation, has started in on his own hook, as an aviation insurance broker, with headquarters at the United Airport, Burbank.

OUR old friend, Roy T. Minor, and his father-in-law, H. A. Ludwig, have taken over the Southern California distributorship for Waco and are located at the United Airport, Burbank, Calif.

MARION McKEEN, together with J. B. and H. H. McCandless and G. Preston Jackson, making their headquarters at the Los Angeles Municipal Airport, Inglewood, Calif., under the title of the Marion McKeen Aeronautics Ltd., announce the opening of a school of aeronautics.

CHARLIE BABB and Eddie Deeds recently opened a new and used plane agency, with headquarters at the American Airport.

THE Hancock Foundation at Santa Maria has recently turned over an entire building to its engineering department to be used as an experimental and research laboratory for cadets taking the newly organized aeronautical engineering course.

WHILE at Clover Field, Santa Monica, we had an opportunity to witness a demonstration of the little "Flying Bull Pup," a product of the Buhl Aircraft. The little plane was flown across country, from the factory at Marysville, Mich.

An all-metal sport plane, powered with a 45-horsepower Szekely motor, this is the first of these little planes to reach the West Coast. Mr. Chas. B. Hughes, Buhl Aircraft distributor for Southern California, with headquarters at Clover Field, has the distributorship in this territory. This ship was described in the February issue of AERO DIGEST.

CALIFORNIA

Kinner Production Increases

PRODUCTION at the Glendale plant of the Kinner Airplane & Motor Corporation, Ltd., is being stepped up to meet a demand for the company's engines, which exceeds the volume of business for the corresponding period of 1930 by more than seventy-five per cent, according to a recent announcement of Robert Porter, president of the company. Shipments of engines in the first two months of 1931 exceeded by twenty-four per cent those of the entire first quarter of 1930.

Boeing School of Aeronautics

THE Boeing School of Aeronautics in 1930 flew 5,783 hours in training planes, of which 4,461 hours represented solo flights, according to a recent announcement of officials. The Boeing school's January 5 quarterly class recruited thirty-three new students, of which thirty-one were enrolled for master pilot and master mechanic courses. The teaching staff comprises fifteen ground school and three flying school instructors.

The U. S. Bureau of Immigration has recognized the Boeing school as an approved training institution for non-quota immigrant students.

A model Autogiro for wind tunnel use to demonstrate the principle of this type of aircraft, has been added to the equipment of the Boeing school.

DEVELOPMENT of a new aerial navigation instrument designed to permit the observer to find his position in one single operation, without recourse to intricate mathematical computations, has been announced by Ensign Howard B. Kaster, U. S. N. R., at the University of California.

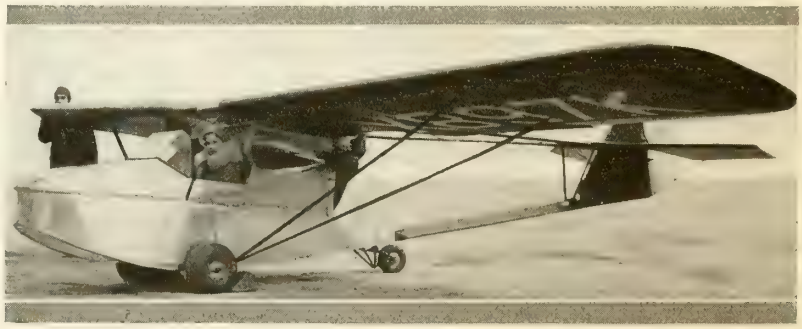
The new instrument, known as the pherant, can also be used for night observations when the horizon is invisible.

Kinner to Make Three Engines

THREE aircraft engines will comprise the 1931 line produced by the Kinner Airplane & Motor Corporation, Glendale, Calif., according to a recent announcement of company officials. These engines, all of which are five-cylinder radial air-cooled powerplants, are as follows: Model C-5, rated 210 horsepower at 1,900 revolutions per minute; Model B-5, 125 horsepower at 1,925 revolutions per minute; and Model K-5, 100 horsepower at 1,810 revolutions per minute.

ARRANGEMENTS for authorized service and replacement parts for Warner Scarab engines on the Pacific Coast have been completed by Warner Aircraft Corporation. The contract for a service depot has been made with Roy Metz, who operates Aero Motor Service at Oakland airport, Oakland, California. The territory comprises Northern California and the State of Nevada. Aero Motor Service will carry a stock of replacement parts to service the Scarab engines, and it is equipped to give repair service.

THE Consolidated Air-Lines are operating a daily air transport passenger service between the Sacramento and San Joaquin Valleys to the San Francisco Bay district. Ford trimotors and a Curtiss Kingbird are used. Planes connect with W. A. E. and West Coast Airlines at San Francisco.



Akerman pusher-type two-place monoplane powered with 45-horsepower engine



Northrop low-wing cabin monoplane equipped with Edo floats for which an Approved Type Certificate has been issued

Beverly Gilmore is president of the Consolidated company; B. W. Helm, secretary; Sterling Boller, chief pilot; and Dana Boller, Gene Tigar and Jack Horner, pilots.

ALAMEDA

[H. V. WALDORF]

FIRST anniversary of the air ferry service across San Francisco Bay was celebrated by Air Ferries Ltd., February 1, in ceremonies held at Pier 5, the San Francisco terminal.

More than twenty planes, including the aerial fleet of the Standard Oil Company, took part in the program.

Ted Huggins, passenger agent, was master of ceremonies.

During the year the company made 19,000 round trips in the six-minute service and transported 61,245 passengers.

The company's eastern terminal is at the San Francisco Bay Airdrome in Alameda.

ALL air service between Pier 5, San Francisco and Sacramento, is provided through a traffic agreement reached by Air Ferries Ltd. and Overland Airways Ltd.

The Overland company maintains a three-round-trip daily service between the San Francisco Bay Airdrome, eastern terminal of the transbay air ferry service, and Sacramento Municipal Airport.

Plan Aerial Freight Service

WESTERN Pacific Aerial Freighters, unit of the Western Pacific Aviation Corporation of Nevada plans to inaugurate aerial freight service between the San Francisco bay region and Boise, Idaho, early in March, according to an announcement by Monte H. Lukov, president and general manager.

The route of the service will include stops at Sacramento, Reno, Fallon, Lovelock, Twin Falls, and Nampa.

A trimotor Ford is the first unit of the company's proposed fleet of airplanes.

OAKLAND

[H. V. WALDORF]

Gets Highest Airport Rating

OAKLAND Municipal Airport was given an A1-A rating February 6 by the Aeronautics Branch of the Department of Commerce.

The award follows the completion of a three-year development program which transformed the 845-acre area from a barren marshland to one of the leading airports of the nation. The total investment is $1,500,000.

Traveling Flying School

K. L. BLACKBURN, chief pilot of the Fillmore Flying service at Oakland Municipal Airport, has established a "portable" flying school.

Three times a week Blackburn flies to cities in Northern California to give instruction to students in outlying communities.

THE Vallejo Chamber of Commerce has asked the Navy Department for aid in establishing a combined commercial and naval airport on Mare Island, adjoining the city.

AEROGRAPHIC flights to check upper air conditions at the proposed naval dirigible base at Sunnyvale were started in February by the Oakland Municipal Airport Naval Reserve Squadron.

The tests range to 10,000 feet altitude.

AN airplane engine service and repair station was opened at Oakland Municipal Airport February 1 by the Pacific Airmotive Corporation. Edwin Cooper is in charge.

NORTHWEST

[F. K. HASKELL]

To Extend Airline

PLANS for extension early in March of the Bennett Air Transport Company's Coos Bay-Springfield-Portland-Tacoma airline to Bend and Burns, Ore., and for a new hourly service around Puget Sound and as far south as Aberdeen have been announced by A. A. Bennett, president of the company. Zenith equipment will be used.

AT the annual meeting of the National Solo Flying Corporation, Portland, Ore., J. E. Allen was reelected president; Vernon Williams, vice president; I. C. Allen, treasurer; and Thomas C. Burke, secretary. On the board in addition to the officers are E. J. Swindells and Vern Dusenbery. Plans were discussed for development of their ten-acre field.

Planes and Pilots in Oregon

OREGON has 68 licensed airplanes, 51 unlicensed airplanes, a total of 119 aircraft, not including eight licensed gliders, according to the U. S. Department of Commerce. There are 180 pilots licensed in Oregon, including 76 transport pilots, 27 limited commercial pilots, 77 private pilots and one glider pilot.

FAIRELL JOSLIN of the Rogue River Flying service will establish a school of aviation at a new landing field at West Rainer, Ore.

New Aircraft Factory

PLANS are announced by Mrs. M. E. Cuppage, principal owner of the Triton Aircraft Corporation, of the establishment of a factory at Portland, Ore., for building the Triton amphibion.

Varney Air Lines Activities

FIXING of fares on Varney Air Lines at 8.3 cents per air mile resulted in only slight changes in the existing fares, the company reports. These fares, coupled with the reduction on Boeing Air Transport's Salt Lake City-Chicago line, were substantially lower than formerly charged between the Pacific Northwest and the Middle-West.

Following conferences between Louis Mueller, president of Varney Air Lines, and P. G. Johnson, president of the Boeing Companies, the traffic and operating departments have worked out policies of coördination. Boeing System will handle the traffic and publicity for the Varney Lines. Varney ships will be serviced by Boeing System at Seattle and Salt Lake City and Varney will service Boeing ships at Portland.

WASHINGTON

JAMES P. MURRAY, early air mail pilot and lawyer, has been made vice president of the Boeing Airplane Company. Mr. Murray learned to fly with the British Army during the war. He became one of the first pilots employed by the Post Office Department and continued to fly the mail for eight years. In 1927 he completed his law studies and was admitted to the Wyoming bar. Before his advancement to the vice presidency he was Eastern representative for the Boeing companies.

BOEING AIRPLANE COMPANY, Seattle, Wash, has delivered 131 of the Wasp-powered P-12C single-seater fighters to the Air Corps. Twenty-two were delivered during January and the total contract of 131 planes was completed in February. The planes were for fly-away delivery.

The first Boeing Navy model F4B-2

(*Continued on next page*)

(*Continued from preceding page*)
single-seater fighter, similar to the P-12 except for flotation gear and deck arresting equipment, was flight tested in December by a flight test board of the Bureau of Aeronautics.

The latest Boeing fighter, which used P-12C standard wings and landing gear and horizontal tail surfaces with metal monocoque body, has been undergoing practical tests.

[C. M. LITTELJOHN]

THE Pacific Air Transport, holding its annual meeting recently elected P. G. Johnson of Seattle president and chairman of the board; C. E. Johnson, present operations manager of the line, vice president in charge of operations; C. E. Brink, auditor; D. E. Drew, treasurer; and R. C. Bradshaw, secretary. Poundage and passengers carried in 1930 on the Seattle-San Diego route exceeded records of previous years.

CAPITALIZED at $5,000, the Western Airways Corporations was recently incorporated at Seattle. Incorporators are R. L. Chester, A. L. Lee, Jan Russel, F. A. Hines and L. B. Keene.

KELSO has voted to purchase its airport from the airport corporation. The city council passed a resolution to this effect recently, naming $19,800 as the sum to be paid.

TACOMA will develop its airport during the present year, the Pierce County commissioners having adopted a one-year development program at a recent meeting.

A RESERVE observation squadron for Sand Point, Seattle naval aviation base, has been authorized for early recruiting. Capt. L. B. Stedman, Jr., commanding Marine Corps Reserve flight training, will establish the Reserve unit of twenty-two officers and 160 enlisted men at an early date.

UTAH

[G. PERRINS]

A BILL providing for state licensing of aircraft and pilots operating within the boundaries of the state has been drafted by the public utilities commission and submitted to the attorney general. The bill would exempt aircraft in the state or Federal service and those engaged in interstate commerce.

ANOTHER act, designed to eliminate legal difficulties which might bar a Utah city from owning, operating and policing a municipal airport has been introduced in the state legislature.

The bill enables municipalities to acquire land for airports, acquire air rights, maintain suitable lights and other markings and guides, raise money by taxation to build and operate airports, etc.

A TOTAL of $740,000 is being expended during the present fiscal year by the Salt Lake airways district office of the Department of Commerce under the direction of W. E. Kline, airways engineer. Of this amount approximately $200,000 is being spent annually in Salt Lake.

COLORADO

[I. R. ALEXANDER]

INCORPORATION of the Nelson Aircraft, Inc., Pueblo, Colo., has been announced. The incorporators are W. G. Nelson, H. M. McCarthy and S. Parlapiano.

MORE than $100,000 will be expended on the improvement of the airport at Denver, according to William F. Wunderlich, manager of the airport. The improvements include a new hangar, garage and dope shop. The hangar will have approximately 600 more square feet of floor space than the present hangar, and will accommodate twenty small planes or fourteen planes of the type now being used for passenger transportation out of Denver.

WESTERN BRIEFS

THAT the Southwestern section of the United States enjoys the best general all-year weather in the country, is indicated by extensive meteorological observations made by W. H. Clover, senior meteorologist for the T. A. T.-Maddux Air Lines. This area, including most of California, Arizona and New Mexico, is less harassed by storms, fogs and climatic adversity than reported for any similarly sized district.

OFFICIALS of the Arizona Sanitary Livestock Board have found a way to locate stolen cattle, if not the marauders. Recently two airplanes went on a mission to the Northeastern part of the state and upon their return reported locating several bands of stolen cattle in secluded sections. Because of the treacherous trails leading into the haven of the band of cattle thieves, the posse have been unable to follow. The stray bands located by the pilots have been rounded up by livestock inspectors and placed where owners may identify them.

THE pay roll of the Boeing Airplane Company at Seattle totals 1,026, the largest since the early spring of 1930, according to a recent announcement of company officials.

ROBERT JELLISON, head of the glider division of the Varney Air Service at Oakland Municipal Airport, has invented a safety tow rope release, which he is using in demonstration work. Two of the releases are used in student training work. One release is attached to the end of the tow rope and is controlled by the instructor; the other tow rope is attached to the nose of the glider. When the glider appears to be getting out of control of the student, the instructor operates the ground release, disconnecting the tow rope. Jellison has patented the release. It was originally designed for use in logging work.

THE Boeing Airplane Company utilizes electric baking ovens with temperature control for obtaining the desired finish on cowlings and the entire bodies, which can be placed on the Boeing Company's thirty-foot oven. These ovens are thermostatically controlled.

A SIMPLE, compact unit controlling the three-engine magneto switches and a master ignition cutout switch for multi-engined airplanes has been designed and built by John Harding, Jr., of the Boeing Airplane company. All engines can be shut off simultaneously by pulling a lever one inch.



(*Acme-P & A Photo*)

Flying model of the Cycloplane and the training model with same controls, which does not leave the ground

NEW AERONAUTICAL BOOKS

Reviewed by STEPHEN A. McCLELLAN, B.Sc.

AIRCRAFT PROPELLER DESIGN

By FRED E. WEICK

PROPELLERS are something about which the aircraft industry knows entirely too little. Fred Weick has rendered a great service in presenting such a complete and up-to-date work on the subject.

The momentum theory, the blade element theory and modified blade element theory are discussd. Airfoil characteristics are properly treated before taking up the blade element theories. Proper propeller testing, the effects of blade shape, tip speed and body interference are capably handled.

The chapters on the effect of propeller characteristics on airplane performance, the variable pitch propeller, tandem propellers and the gearing of propellers will be of interest and value to all aircraft designers. For the propeller engineer, Mr. Weick discusses materials and forms of construction, stresses and their calculation, and design procedure.

All terms employed are well defined, all symbols used are properly listed and the work is well indexed. To the interested technician we recommend it with pleasure.

AIRPORTS

Their Location, Administration and Legal Basis

By HUBBARD, McCLINTOCK AND WILLIAMS

THIS work is a product of the Graduate School of City Planning of Harvard University. As indicated by its subtitle, it contains a very broad discussion of the manifold problems connected with airports. No attempt can be made here to outline fully the numerous problems discussed.

The text is based on an extensive and intelligent survey of existing facilities in all sections of this country. Conclusions are reached only after impartial discussion of the survey findings and are intended as guides for those who are thinking out their particular airport problems rather than as rigid working rules. The appendix is voluminous. The most pertinent of the survey statistics are recorded here. Everything can be readily located from the index.

We earnestly recommend a careful reading of this volume especially to chamber of commerce secretaries, airport comitteemen and, last but not least, airport managers.

AUTOMOBILE AND AIRCRAFT ENGINES

By ARTHUR W. JUDGE

MR. JUDGE has produced a work which will serve equally well as a basic text for instruction or as a reference book. Since this is a discussion of theory and methods of test, the fact that British practice furnishes most of the subject matter may be considered of value by the technicians to whom it appeals.

The general phases of internal combustion engines covered are: explosion and combustion, including known facts, theory and thermodynamics; ideal and real conditions and efficiencies; conduction radiation and cooling effects; temperatures, pressures and volumetric efficiency; altitude effects and supercharging; detonation; high speed compression ignition; mechanics and engine balance; and automobile and aircraft engine fuels.

In view of the widespread acceptance of the radial air-cooled engine in this country, it is regretted that more detailed attention is not paid to air-cooled cylinders and their manifold problems.

LIGHT AERO ENGINES

By C. F. CAUNTER

FRANKLY, we would not have been able to discover why this book was written had not the author pointed out in his foreword that "no book has as yet been produced on this subject." The text gives one the impression of reading a compounded illustrated catalog covering numerous engines included in the same category of power or design type. This is neither a book of design theory nor of maintenance practice. Therefore, let us call it a combination museum and compendium of general facts.

It is unfortunate that many of the American light engines listed are now obsolete and the most interesting of the newer models are completely missing.

AN ELEMENTARY COURSE IN GLIDER FLYING

By CAPTAIN ARTHUR LA ROE

Published by the Glider Institute

THIS is the story of the glider prepared for specific consumption by youngsters of twelve, or older. All straightforward mathematics has been eliminated and physics is introduced not as a pure science but as known facts of nature. This is accomplished by comparisons with familiar objects of everyday life.

The course is divided into five sections, each covered in a separate paper-bound pamphlet. Historical background, theory of flight, glider construction, launching and flight instructions, suitable terrain and the weather are used as general classifications.

The booklets are set in clear type. Simple language is employed. A very practical part of the course is a set of well balanced questions for review purposes included at the end of each pamphlet.

THAT NEXT WAR

By K. A. BRATT

NEITHER fiction nor a lecture to a foregone conclusion, this work is a recitation of certain basic facts and an exposition of the major variant theories regarding war and peace which have been developed from them. The entire text is written with great clarity and discusses its subject with impartiality.

The work seems intended to stir up controversy in the hope that a strong reliable substitute for warfare may be evolved. Major Bratt takes full cognizance of human nature and points out the impotence of pure pacifism as forcefully as he illustrates the economic futility of war. Much space is devoted to an excellent projection of the tremendous part aviation will play in any future military campaigns.

SIMPLIFIED AERODYNAMICS

By ALEXANDER KLEMIN

HERE is an excellent text for the individual who wants to get the high lights of the technical facts and computations behind the various phases of aircraft design without the necessity of wading through reams of detailed material in the hope that he can sort out the proper things upon which to concentrate. A few chapter headings will indicate the scope of this condensed work: "Useful Mathematical and Mechanical Principles"; "Properties of the Air and Atmosphere"; "Elementary Principles of Flight"; "Streamline Flow; Bernouilli's Law"; "Elements of Performance Calculation"; and "Elements of Airplane Mechanics."

TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

Westinghouse Condensate Pumps

TWO bulletins describing the single-stage and the two-stage condensate pumps made by the South Philadelphia Works of the Westinghouse Electric & Manufacturing Company, were recently published.

Rusco Glider Products

GLIDER accessories known as Rusco Glider Products are described and illustrated in a leaflet recently issued by the Russell Manufacturing Company, Middletown, Conn.

Aluminum in Aircraft

PREPARED by the technical staff of the Aluminum Company of America, Pittsburgh, Pa., to meet the demands of students, pilots, mechanics and aircraft metallurgists for comprehensive information on the uses of aluminum in the aeronautical industry, a book entitled "Aluminum in Aircraft" has been published by the Aluminum Company.

Booklet on Alectral

DESCRIBING a new product known as Alectral, the trade name of insulated aluminum wires and cables offered by the General Cable Corporation, New York, N. Y., a booklet has been issued by the General company. The salient features of Alectral and some of its more important applications are given.

Socket Wrench Catalog

A CATALOG devoted exclusively to the socket wrenches manufactured by the Billings and Spencer Company, Hartford, Conn., was recently issued.

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AIRCRAFT

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American Aeronautical Corporation
Sales Office:
Port Washington, Long Island, N. Y.

AIRD PLANES CHICAGO-BUILT
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Territories open for Dealers and Distributors. Write for details to
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4500 West 63rd Street Chicago, Illinois

Exporting Aircraft

AMERICAN manufacturers of aeronautics products, although they have improved, leave much to be desired in their methods of handling the seemingly trivial things which are generally neglected, according to Leighton W. Rogers, Chief of the Aeronautics Trade Division, Department of Commerce.

In this connection, Mr. Rogers states, an American pilot-salesman in one important market reports as follows:

"Our greatest grievance is the lack of reliable complete information concerning the various models and types of planes manufactured. We must know not only their performance figures, but what size cases they are packed in, how much they weigh, and how they are to be assembled.

"It certainly would not cost more than a dollar or two for the shipper to include a handful of extra cotter keys, a coil of safety wire, a few extra bolts and some tape, a quart of dope and a little fabric for patching. Perhaps they do not realize that in my territory, at least, there is no available aircraft material.

"The various manufacturers should also secure a registered cable or telegraphic address, and include this in all of their advertising. Many times we have desired to cable for something we have seen advertised in our trade magazines, but to do so, we would have to pay for about six or seven words extra in their address. This could be avoided if they had thought far enough ahead to provide a cable address of one word.

"We have opened five shipments of airplanes, and not one of them has been complete. Something has been left out every time, and it surely does not impress the purchasers in a very favorable manner, especially if we have to wait four months for air speed indicators, or dual controls which should have been sent. On the other hand, the packing has been splendid. We have no complaint on that score.

"None of the companies seem to have any parts lists or prices of parts for their planes. Some provide a few typewritten sheets of parts and prices, but they are not complete, and generally we cannot decide whether these prices are our net cost, or the retail price to the customers.

"Blueprints showing proper methods of assembly are not in evidence unless we write in months ahead of the shipment urging that these be sent. When we do receive them sometimes they are contradictory."

The Aeronautics Trade Division, Mr. Rogers said, will shortly have in effect a standardized system of presenting accurate performance and specification data for the use of foreign representatives and takes this means to direct to the attention of the industry the need for coöperation in compiling these data.

These instances cited of uncoördinated and inadequate handling of export business are by no means unusual. If American manufacturers are to increase or even maintain their export business they must give this activity the attention which its importance warrants.

DIGEST OF FOREIGN TECHNICAL ARTICLES

(*Continued from page* 64)

JET PROPULSION

Jet Propulsion for Aircraft, E. G. Richardson. "Royal Aeronautical Society Journal," Vol. 35, 241, January, 1931, pp. 29-36, 9 figs.

EXPERIMENTS are described which were aimed at the examination of the aerodynamic properties of simple forms of air-jet propulsion. Rockets with interiors of a plain cylindrical tube, expanding cone, or a cylindrical tube with disk at the end were designed for the experiments, and their resistances measured. It is shown that the reaction of a jet of gas may be used as a propulsive force with suitable designing of the nozzle, and the means of applying this form of propulsion to aircraft are considered. The author found flight with jet propulsion exceedingly pleasant. It is concluded that the rocket chamber of the plane needs adequate fire insulation, that a pterodactyl type of plane with the rocket in the body of the plane seems desirable, and that the supply of energy in the jet must be maintained by a constant supply of liquid reagents mixed in an explosion chamber and fired at the instant the exhaust nozzle is opened.

YAWING FORCES

Maximum Force on the Fin and Rudder of a Bristol Fighter, F. B. Bradfield and R. A. Fairthorne. (British) Aeronautical Research Committee—Reports and Memoranda No. 1330 (Ae. 462), May, 1930, 4 pp., 4 figs.

THE investigation reported was undertaken to determine the maximum normal force on a fin and rudder when the aircraft is yawed. Yawing moments were measured on a Bristol Fighter model with the standard rudder and with the R.A.E. large rudder, the rudders being set at large angles and the model yawed. Yawing moments without fin and rudder were measured, and normal force on the fin and rudder deduced. At 9 degrees wing incidence, the normal force coefficient for the standard rudder increased from 0.29 at 0-degree yaw to 0.61 at 25-degree yaw with 30-degree rudder angle, and with the large rudder increased from 0.35 at 0-degree yaw to 0.58 at 30-degree yaw with a 25-degree rudder angle.

TESTING SLOTTED WINGS

Stalled Fight Tests on a Bristol Fighter Fitted with Auto Control Slots and Interceptors, R. P. Alston and Pilots of Aerodynamic Flight, R.A.E. (British) Aeronautical Research Committee—Reports and Memoranda No. 1338, June, 1930, 3 pp., 1 fig.

RESULTS of tests of a Bristol fighter plane fitted with Handley-Page automatic control slots and interceptors are discussed. In this case the slot, interceptor and aileron are interconnected by a mechanism which allows the interceptor to come up only when the slot is forward. When the slot is back, as in normal flight, full aileron may be applied without causing any fouling of the slot and interceptor. The lateral control at the stall of the Bristol fighter fitted with this type of control was very good. The mechanism in its form at that time did not permit the interceptor to have sufficient movement to affect the motion in a spin, but a three-axis rate of turn recorder has been fitted and measurements of the motions resulting from the use of the control at stall are being made.

DIRECTIONAL STABILITY

Directional Stability of High-Speed Aircraft, W. G. Jennings. (British) Aeronautical Research Committee—Reports and Memoranda No. 1340 (Ae. 472), May, 1930, 4 pp., 17 figs.

AS A result of a report that some high-speed aircraft are directionally unstable when flying at small angles of incidence, the problem of directional stability was investigated from a practical point of view. The azimuth and rudder angles of a Hawker "Hornbill" plane flying at high speeds were measured with several pilots using various conditions of rudder-cable rigging and rudder-hinge friction.

It was shown that the ability to maintain a straight course with this plane flying at high speed was largely a matter of the pilot's skill and experience.

FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST'S correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

GERMANY

(EDWIN P. A. HEINZE)

PASSENGERS on the German airline from Berlin via Dresden and Prague to Vienna may now send radiograms from the machine in flight. The rate is approximately twenty-four cents a word. The message is sent from the plane to the next airport where it is re-transmitted to its destination.

Air Traffic at Tempelhof

THE Berlin Central Airport (Tempelhof) is generally considered the busiest civil airport in Europe. The following figures contained in the 1930 statistics of traffic at this field may be of interest.

	1930	1929
Take-offs	14,758	10,835
Landings	14,711	10,823
Passengers	48,431	42,440
Mail	158,000 lbs.	488,000 lbs.
Newspapers	27,400 lbs.	189,500 lbs.
Total freight, including luggage, mail, etc.	2,090,000 lbs.	2,350,000 lbs.

The airport maintains accommodations for the general public, including restaurants, cafés, and public terraces. In 1930, a total of 650,334 persons visited the field, as compared with 1929, when there were 776,116 visitors.

SECOND largest German air transport company, Nordbayerische Verkehrsflug Company of Nuremberg, has changed its name to Deutsche Verkehrsflug Company. The former name, meaning Bavarian Air Transport Company, was changed in favor of the new name, meaning German Air Transport Company, because activities have been extended beyond Bavaria into other German states.

FOCKE-WULF, German aircraft manufacturers, announce the completion of a new model airplane designed principally for fast air mail work.

JUNKERS have announced that the Greek air transport company, Ikaros, has ordered four trimotor Junkers G.24 eleven-place ships. This type of Junkers plane is used extensively in numerous countries. The ships to be delivered to Greece are said to incorporate a number of new improvements.

News of the *Graf Zeppelin*

THERE have been rumors that the *Graf Zeppelin* (not the new airship under construction, but the old one of world-flight fame) is to be reconstructed for filling with helium instead of hydrogen. We are informed that this rumor is unfounded. The *Graf Zeppelin* is now lying at Friedrichshafen, where it is undergoing a thorough overhaul for flying next season.

The proposed flight to the North Pole, however, seems to have been abandoned. The Zeppelin company has definitely dropped the plan for a scientific expedition to the northernmost regions of the globe. But a flight will be made to colder regions in order to obtain experience for a proposed flight to Alaska.

Private Sport Flying

PRIVATE sport flying is making rapid progress in Germany, much more than was anticipated, especially in view of present financial conditions.

Recently an association of German students formed an aviation division which has affiliated with the German Air Union. The division has acquired six sailplanes and has ordered three Klemm powered planes.

Another club associated with the German Air Union, Mannheimer Luftfahrtverein, has reported a great increase in activities during the past year. This club, only one of the many flying clubs which are active in Germany, possesses a balloon, three powered planes and five sailplanes. No fewer than 4,671 take-offs were made in 1930 in the three powered ships, and 1,500 were made with sailplanes.

Another club, Luftfahrtverein Essen-Oberhausen, owns seven powered planes, eight sailplanes and two balloons.

ENGLAND

Plan United States to India Air-Ocean Freight Transport Service

ARRANGEMENTS for the inauguration of a combined plane and steamship freight transport service between the United States and India via London have been completed between Imperial Airways, Ltd., the Cunard Steamship Company and the White Star Line. It is planned to connect with the San Francisco-New York air mail service, giving a 12,000-mile air-ocean-air service from the West Coast of the United States to India.

According to tentative plans, freight will be flown across the United States to New York; from New York twice-a-week connections will be made with vessels of the two steamships companies, which will carry the express to England; an Armstrong-Siddeley plane of Imperial Airways will transport the freight to Athens; and a trimotor Short-Jupiter flying boat will carry the express over the Mediterranean, transferring the cargo to a DeHavilland Jupiter landplane for the final stage of the journey across the Iraq Desert to Baghdad, the Persian Gulf and India.

It is estimated that the entire journey from San Francisco to India will require fourteen days.

An extension to this projected air-ocean freight service is planned with the England-South Africa route of Imperial Airways, connecting the American continent with Africa.

Imperial Airways African Service to be Opened for Traffic March 5.

THE 2,670-mile North African section of the Imperial Airways London-Cape Town air route will be opened for traffic March 5 when an inaugural flight will be made from Cairo to Mwanza, the plane arriving at the latter city March 9. The service will be operated weekly in each direction.

The flight from London to Mwanza will require nine days as compared with twenty-four days by surface transport. A return flight will start from Mwanza, March 10, arriving at Cairo, March 14 and reaching London, March 18. The departure from London to establish the first connection at Cairo with the North African section was scheduled February 28. The total distance from London to Mwanza is 5,114 miles.

THE British aircraft carrier *Eagle* will be stationed at Buenos Aires for about a month while the British Empire Trade Exhibition is in progress. In addition to her full equipment of naval aircraft, the aircraft carrier will be equipped with a number of special types of military aircraft.

(Continued on next page)



(Acme-P & A Photo)

Preparing for flight test of Lockheed Vega purchased in United States for use on London-Cape Town flight by Glen Kidston and crew of two

(*Continued from preceding page*)

A PLAN for renting aircraft to light airplane clubs has been inaugurated by the DeHavilland Aircraft Company, Ltd. The planes at the disposal of the clubs will be Gypsy I Moths with wooden fuselages and each equipped with a telephone, automatic slots and a compass.

Each plane may be hired for any period up to six months for sixty pounds sterling ($291.60) per month; and for any period of more than six months for fifty pounds sterling ($243) per month. Te DeHavilland Company fully insures planes against all ground and air risks, including third party risks.

Planes obtained by clubs according to this plan must be maintained at their expense in a correct airworthy condition and must be operated in accordance with the provisions of the Air Navigation Acts.

A 6,200-MILE demonstration tour of the British Isles was recently completed in less than three months by a Westland "Wessex," a trimotor six-place cabin monoplane. In the course of the tour, the ship visited twenty-two airports in the British Isles and crossed the Irish Sea twice. Although adverse weather conditions were encountered throughout the tour, the plane arrived at every destination on time with two exceptions when held up by fog.

Developing Oil-Burning Aero Engines

DETAILS have been revealed recently of work done to Air Ministry instructions in the conversion of certain types of Rolls-Royce aero engines to "compression-ignition" working, the powerplants running on heavy oil instead of regular aviation fuel. Special parts for oil burning have been designed for a Condor 650-horsepower unit by engineers of the Royal Aircraft Establishment. According to reports, this engine has maintained a steady and economical output of power.

Another engine, a converted "F" type unit developing about 500 horsepower with gasoline as the fuel, has been equipped with special parts for oil burning and is being tested.

DENMARK

Danish Aviation Company Active

SUBSIDY of approximately $67,600 will be given annually for the next four years to the Danish Aviation Company. Three-fifths of this amount will be used for operating expenses and the remaining two-fifths for the purchase of new equipment. The subsidy will be granted under the condition that the City of Copenhagen will place $26,800 at the disposal of the company over the same period.

The 1931 flying season of the Danish Aviation Company is scheduled to start on March 15, when the service of the Copenhagen-Hamburg route and that operated in conjunction with the German Luft Hansa on the Malmo-Copenhagen-Berlin route will be placed in operation. The company will participate in the night air mail service between Scandinavia, The Netherlands and Paris-London, scheduled to start May 1 and continue for four months.



(*Acme-P & A Photo*)

Hon. Mrs. Victor Bruce completing at New York, U.S.A. on February 5 final lap of a London-to-London plane-steamship world journey which started on September 25, 1930

The Danish Aviation Company operates four single-engined Fokkers.

SWEDEN

International Aero Exhibition

THE International Aeronautical Exhibition will be held at Stockholm, May 15-31. The exhibition will embrace nine sections of aeronautical displays, including exhibits of aircraft; aircraft engines; equipment such as instruments, wireless apparatus, armament, parachutes and safety equipment; raw materials for aircraft and engine construction and aviation fuels; air transporation and airport equipment; aerial survey and photography; aerotechnics and research; historical section and literature pertaining to aeronautics.

Exhibitors of aircraft may give flying demonstrations of their planes at the Stockholm airport.

SWITZERLAND

IMPROVEMENT of the airport at Berne is to be completed about May 1, when the air traffic at the field is expected to increase with the advent of the summer air touring season. It is planned to enlarge the hangar for the accommodation of overnight planes, and to expend approximately $3,500 for additional lighting equipment. The government will provide funds for the improvements.

AUSTRALIA

Southern Cross in Sydney Museum

THE historic plane, *Southern Cross,* has been placed on permanent exhibition in the Sydney Museum, Sydney, Australia. This plane was used by Wing-Commander Charles Kingsford-Smith on a 'round-the-world journey from Oakland, Calif., U. S. A., to Australia and return, which was completed in July, 1930, more than two years after the start.

In the course of this flight in the *Southern Cross,* Wing-Commander Kingsford-Smith completed the first aerial journey from the United States to Australia across the Pacific Ocean; a flight from Australia to England in thirteen days; and a trans-Atlantic flight from Ireland to Newfoundland.

On the trans-Atlantic leg of the world flight, Kingsford-Smith in the *Southern Cross* made the third successful East-West crossing of the North Atlantic by heavier-than-air craft; and the second non-stop westward crossing by heavier-than-air craft. In addition, he completed the second flight by heavier-than-air craft from Europe to the United States, and a transcontinental flight from New York to California.

The *Southern Cross* is a trimotor Fokker monoplane which was rebuilt from two Fokker planes used by Sir Hubert Wilkins in his North Pole explorations.

CANADA

Several Companies Involved in Government Aircraft Purchase

PURCHASE of six special Bellanca "Pacemaker" cabin monoplanes by the Canadian government was announced recently by J. O. Rae, sales manager of the Bellanca Aircraft Company of Canada. The planes, their engines and seaplane floats will be manufactured in Canada at a total cost of approximately $200,000. The ships will be equipped for aerial photography and surveying and will be built for use as landplanes or seaplanes interchangeably.

Each plane will be powered with a single Wright Whirlwind 300 engine, built at the Montreal plant of the Canadian Wright, Ltd. Two of the planes will be equipped with Edo floats, built by MacDonald Brothers of Winnipeg; two with Shortt pontoons constructed by General Aircraft Builders of Montreal; and two will have pontoons made by the Fairchild Company at their Longeuil plant.

Under the term of a special contract between the Bellanca company and the Canadian Vickers, Ltd., Montreal, the planes will be built and assembled in the Vickers plant.

Develop New Boeing Plane

PRODUCTION of the Boeing "Totem," an all-metal, four-place, high-wing cabin monoplane has been started by Boeing Aircraft of Canada, Ltd., according to a recent announcement of company officials. The ship is of the seaplane type. For winter use it may be equipped with skis for landing and taking off on the snow. The plane is powered with a single Wasp Junior engine

of 300 horsepower and has a high speed of 117 miles per hour. Weight empty is 2,388 pounds and the weight loaded is 4,000 pounds.

SIR WILFRED GRENFELL recently announced in London, England, that arrangements have been completed for an aerial survey of the interior of Labrador, a country becoming more important each year as mineral development proceeds. The interior of Labrador, adjoining Northern Quebec, and once known as Ungava, is uninhabited and the extent of its natural resources are as yet unknown. Mineral lodes, timber, and large waterfalls for electric power development have been located.

MEXICO

Airline Buys Savoia-Marchetti

A SAVOIA-MARCHETTI S-55 twin-hull flying boat has been purchased from the American Aeronautical Sales Corporation, New York, U.S.A., by the Compania Transportes Aeros Mexico-Cuba, S. A., of Mexico City, Mexico. The ship is reported the first of a fleet of Savoia-Marchetti S-55's which the company plans to use on the Vera Cruz-Havana division of the Mexico City-Havana airline. The company holds the air mail and passenger concession from the Mexican government for the Mexico-Cuba airline.

(M. HURST)

Developing Civil Aviation

A PROGRAM of development of civil aviation in Mexico is planned by the Mexican government. As part of this program, the government has granted increased authority to the Aero Club of Mexico. The association has been empowered to advance the rank of pilots of the department of communications or those taking courses under the supervision of the club; and to organize various events of aeronautical importance to take place periodically.

To Start Air Taxi Service

AN AIRPLANE taxi service between Tampico and a number of nearby towns will be inaugurated by the Cia. de Aviacion Tampaulipas y Huastexas, a new company recently formed by Tampico capitalists. The service will cater especially to oil companies. Nicholas-Beazley low-wing, three-place monoplanes will be used.

Air Activities Increase

SUBSTANTIAL increases in freight and passenger airplane service in Mexico were reported in 1930 over the preceding year. Air mail service suffered a slight decrease because of a new regulation making necessary payment at regular rates for the conveyance of government mail. The Mexican Aviation Company, Mexico City, announced that in 1930 its planes carried 10,553 passengers as compared with 7,052 in 1929; 64,357 kilograms of express, as compared with 19,779 in 1929; 62,996 kilograms of mail, as compared to 83,892; and 14,672 pieces of baggage weighing 137,649 kilograms, as against 9,128 pieces weighing 87,174 kilos in 1929. Planes of this line covered 1,065,782 miles within national territory, passenger planes flying a total of 10,241 hours. In 1929 the planes covered 807,545 miles and flew a total of 8,500 hours. The principal airplane companies reduced their rates during the course of the past year. Establishment of several new lines is contemplated.

CHILE

(H. GOMEZ-CORNEJO)

Pan American Chilean Contract

AUTHORIZING Pan American Grace Airways a four-year concession to operate planes carrying passengers, mail and freight over Chilean territory from the United States and intermediate stops, including Brazil, Argentina, Peru, Ecuador and Colombia, a decree has been signed by President Carlos Ibañez of Chile. The concession is renewable for four years.

Pilots of these planes flying over Peru must be either Americans or Chileans and each ship must carry at least one Chilean pilot over Peruvian territory. During the first year of the concession, the company will undertake to employ pilots one-half of whom are Chilean, and thereafter three-fourths Chilean. The Ordinary National Courts shall rule on any disagreements arising, without diplomatic intervention.

PERU

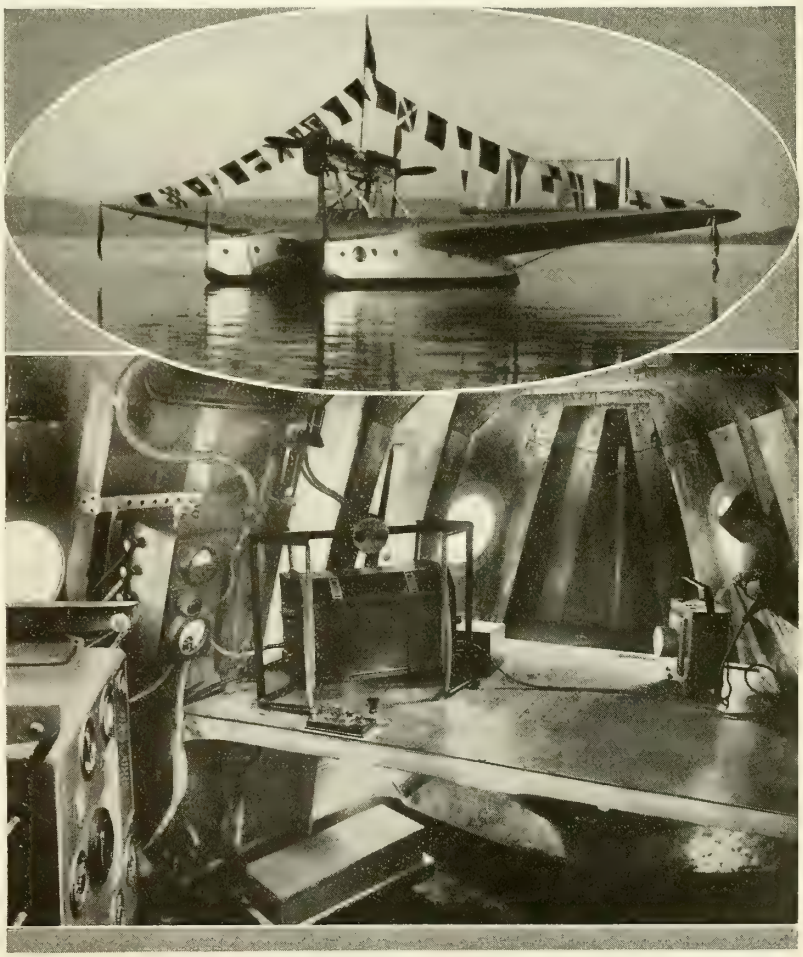
(H. GOMEZ-CORNEJO)

ACTIVITIES of the Shippe-Johnson aerial expedition will be concentrated on aerial photographic surveys of Inca remains along the coast and in the interior of Peru. The work will require not less than six months and was to start February 1 with a flight along the coast. It is planned to fly over the Cordillera from Arequipa to Cuzco; the Sierra of the south and north; and the principal sections of the Montana as far as Iquitos.

BRAZIL

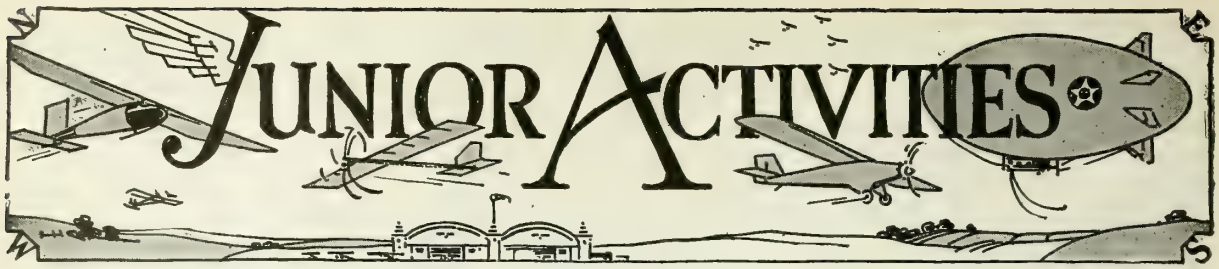
Ford to Build Airports

TWO new airports in Brazil will be constructed by the Ford Motor Company, according to a recent announcement of company officials. One of the fields will be at Para and the other at Boavista. They will be developed to facilitate communication by airplane between the general Ford offices in Para and rubber plantations.



(Stanavo Photo)

Flagship of fleet of Savoia-Marchetti flying boats before start of Italy-Brazil flight. Radio equipment was important factor in successful completion of the journey. Gen. Italo Balbo and companions recently returned to Italy by steamship



ROGERS' R.O.G.-1 MODEL

PRIZE-WINNING TRACTOR BIPLANE OF TRIM DESIGN

By R. E. Dowd

MODEL biplanes have always been less common than monoplanes. In the case of large machines just the reverse was true until recent years. If we consider it further we find that there are some very real and definite reasons that the monoplane has been the favorite with model builders.

After all, the important things an experienced builder looks for in a design are performance, simplicity, lightness, durability and good appearance. In monoplanes each of these may be found to a great degree. Considerations such as wing bracing, compactness, visibility and maneuverability, which are likely to influence designers in favor of biplanes in the full-size machines, naturally never enter into the model builder's plans. Therefore, monoplanes predominate in the realm of models.

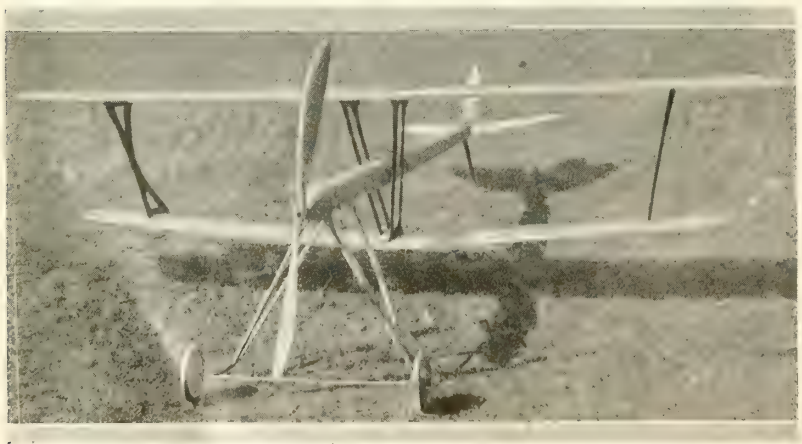
Occasionally, however, we find exceptions to this general rule. The Rogers R.O.G.-1 is such an exception. It is probably one of the most beautiful rubber-driven models ever built. In spite of the fact that its designer and builder had no previous experience in model building, the R.O.G.-1 carried off a first prize for excellence of construction.

Let's take a good look at the assembly drawing. Here we have the three views, top, side and front. If we consider the top view first, we note the upper plane has a sweepback of five degrees, while the lower plane is straight. This arrangement harks back to some early Spad planes, but more recently it has been used on the Curtiss Falcon and the Great Lakes Trainer. Stability and visibility are the reasons usually found for this arrangement. We note also that the fuselage is actually streamline in form. Many builders have been "stumped" in trying to make such a form from flat veneer, but here we have it beautifully done.

Turning now to the side view we note that the upper and lower planes are "staggered." By that we mean they are not directly over one another. When the upper plane is in advance of the lower we say the stagger is positive. The reverse arrangement is called negative and is seldom used.

Another feature of design can be readily seen from the side view. If we note the angle of the upper and lower wing sections, we find they are not the same. The upper is three degrees, and the lower is two degrees. This is commonly called "decalage." In its broadest meaning, decalage applies to the difference between the flying angles of the front and rear surfaces of any type of airplane. Our "Dragon Fly" tandem monoplane (described in November, 1930, AERO DIGEST) had four and a half degrees decalage, for example. More generally, however, it refers to the conditions found in the wing "cellule" of a biplane.

Now we can check the front view. Here the real beauty of the design shows up best. The unusually clean cut lines are the result largely of the flat upper plane and the rather pronounced two-and-a-half-degree dihedral of the lower, combined with the trim fuselage. This should mean high efficiency.



The R. O. G. tractor model designed and built by F. D. Rogers

This Question of Efficiency

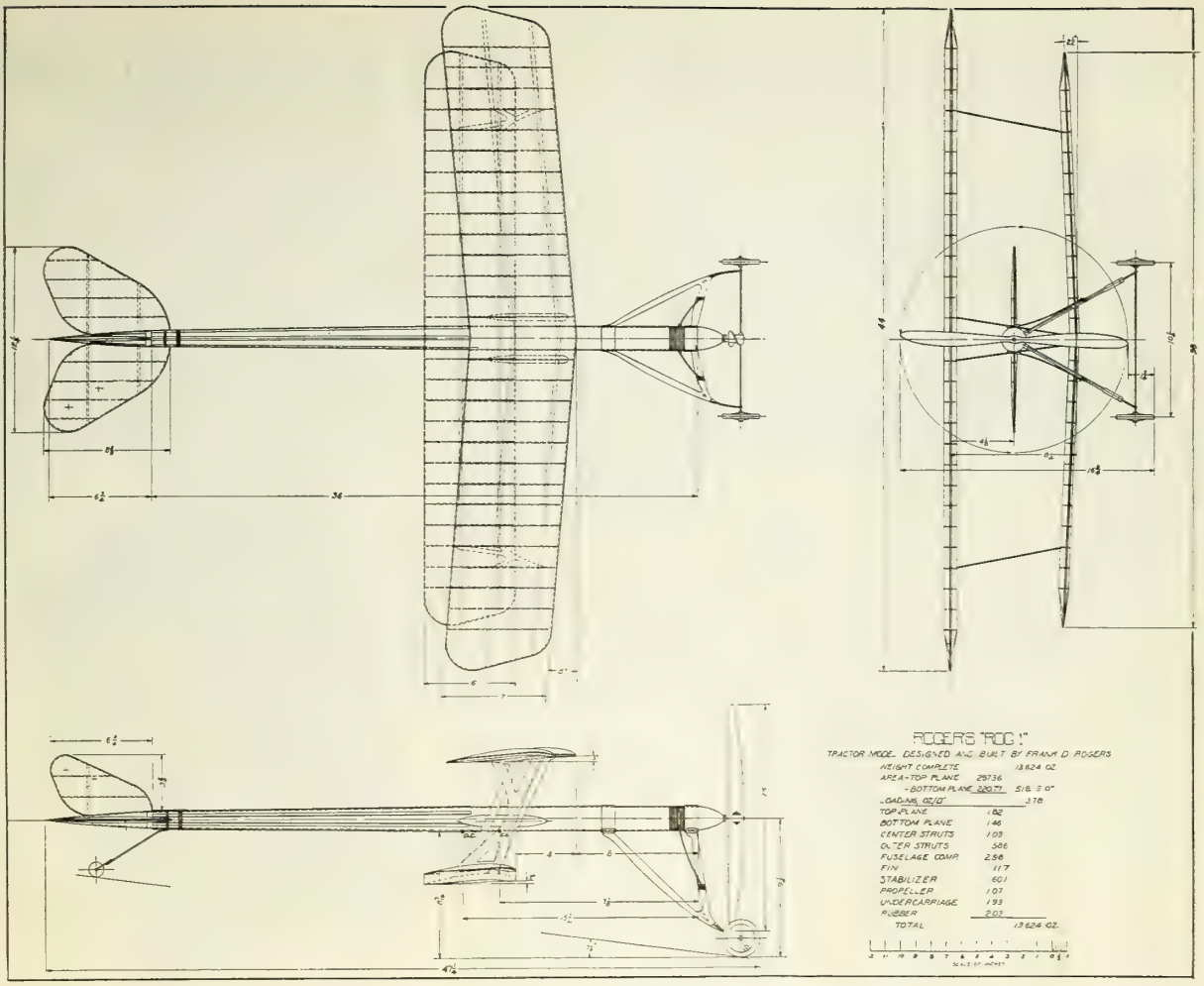
In many of our Junior Activities articles, the question of efficiency has been discussed. In gliders we have a simple means of checking this factor by noting the gliding angle, speed, wing loading, etc. With power-driven models, this is not quite so simple, for we have durations to consider also. For example, a one-ounce model may fly very well with a rubber motor of, we'll say, 10 inches, weighing .20 ounces. Now, if we reduce the length to five inches and keep our weight and balance, the same by adding ballast to represent the five inches of motor removed, we will still have a model which flies just as well, but the duration will be only one-half of the original amount. Now, if we try to determine the efficiency of a model by checking the weight of the rubber motor against the total weight, the one with the five-inch motor would show up better for it will be:

$$\frac{\text{Motor Weight } .10}{\text{Total Weight } 1.00}$$

or 10 per cent, while the 10-inch motor would be $\frac{.20}{1.00}$ or 20 per cent.

This would seem discouraging at first, and we might be led to believe an efficiency formula should include some measure of duration. But here we are worse off than ever, for in present day outdoor planes rising currents of air often carry the light models up out of sight, and it is quite impossible to determine the actual duration of the power.

For general purposes of comparison it would seem permissible to compare the weight of the powerplants in per cent of the total weight of the models, for in each case the designer has tried to put in as long a rubber motor as possible. Of course, the wing loading should also be considered inasmuch as the heavily loaded models must



fly faster and therefore must have greater power.

Table 1 covers models described in Junior Activities. Here we have some very interesting figures. The percentage range from 14 to 32 and wing loadings from 1.2 to 14.8 ounces per square foot.

Without going into too great detail, it would seem that the enclosing of the rubber motors inside streamline fuselages is pretty well justified. Even with similar loadings as in the Horrocks' "Fi Fi" and the R.O.G.-1, we find for comparison 32 per cent and 14 per cent respectively—the very extremes of the tabulation!

Generally speaking, it would seem that if we allow 18 to 20 per cent of our total weight for rubber in designing a model, we shall be on the safe side.

We must note the status of the gasoline-engined "Little Bitty" in passing. With a high loading of 11.3 ounces per square foot our powerplant weight is only 19 per cent.

Table 2 includes some additional mechanically driven large models and some full-size airplanes. Even in these we find the values hovering around 25 per cent as an average.

This little discussion has led us off quite a bit from the R.O.G.-1 but it is worth while to check such matters so as to gain a proper perspective for more intelligent designing and building.

Rogers' R.O.G.-1 Description

Fuselage—As mentioned before the fuselage is of the hollow tubular type but it is also streamlined. This is accomplished by first making a uniform tube of 1/32 inch thick basswood of the diameter of the front end, and then cutting out long trianguler strips, which allows the diameter to be reduced towards the tail. Splines are used to cover the seams thus made. The nose block is turned hollow and mounts the tubular brass propeller shaft bearing. It is shouldered against the tube to resist the tension of the rubber motor. The tail block is built right into the stabilizer. A square shank takes the torsion of the rubber motor.

Wings—The upper wing is swept back five degrees, while the lower plane leading edge is straight. Both planes are of the two-spar, double surface type, with bamboo outline. The webs of the spars are built in sections as in "Bantam" and the ribs are lightened out carefully. The wing curve is the well known U.S.A. No. 5 as used in the Bantam model. Proper spacing of the planes is accomplished by 1/16 inch thick plywood struts, which are clearly shown in the drawing. Dress snaps on the ends of these struts, coöperating with snaps on the planes, provide a quickly detachable mounting. The fuselage tube runs through the V formed by the center struts, and it is here that the wing cellule attaches to the fuselage. Rubber strands are used temporarily, but after the proper location is determined, the struts are cemented to the tube.

Stabilizer—The stabilizer is double-cambered and is set on a direct line with the propeller thrust. It is built around the tail block which anchors the rubber strands.

Fin—The fin construction is the same as that of the stabilizer, and this too is built onto the tail block.

Landing Gear—A pair of V-struts of spruce terminating in a wire extension, which wraps around the axle, comprises the main part of the landing gear. These struts are not rigidly cross-braced as is common practice, but instead they are sprung in position by a pair of piano wire springs, which are clearly shown in the front and side views. As a result the whole gear flexes laterally when a shock is being absorbed. The upper ends of the struts are attached to the fuselage by clips and

(*Continued on following page*)

TABLE NO. 1—Comparision of Powerplant Weight in Percentage of Total Weight

Name and Type of Model	*Total Weight (ounces)*	*Wing Loading (oz. per sq. ft.)*	*Power-plant (ounces)*	*Per cent of Total*
"Pegasus" Single Pusher Monoplane—Tubular fuselage	4.52	6.91	1.00	22
Jr. Lockheed Vega—Single Tractor Monoplane—Tubular fuselage	.25	1.70	.04	16
"Little Bitty"—7-foot span Gasoline Engine, Tractor Biplane	192.00	11.30	37.50	19
"Bantam"—Tractor Monoplane—Triangular fuselage	7.92	4.65	1.22	15
"Watkins' Floater"—Single Pusher Canard Monoplane	5.30	2.30	1.05	19
Kwei Racer—Twin Pusher Monoplane—Exposed Rubber	8.41	14.8	2.62	31
Horrocks' "Fi Fi"—Twin Pusher "A" Frame—Exposed Rubber	7.58	3.3	2.47	32
"Dragon Fly" Single Tractor Tandem Monoplane—Tubular Fuselage	8.11	4.76	1.29	15
Giant Chickadee—Single Tractor Monoplane—Exposed Rubber	.44	1.2	.11	25
R. O. G.-1-Single Tractor Biplane Tubular Fuselage	13.62	3.8	2.03	14

(*Continued from preceding page*)

pins. The wheels are turned from white pine.

Propeller—A clear straight grained blank of white pine is used for the propeller, which is carved out to a pitch of approximately 18 inches. A ball bearing thrust is used on the propeller shaft to reduce friction.

Powerplant—Twenty-six strands of ⅛ inch flat rubber constitutes the powerplant. When the motor is to be wound, the tail is removed and the winder attached. After winding, the tail is replaced and is held in position by the rubber tension.

Performance

We have a particularly sad story to relate in connection with the performance of this model. Its designer and builder conducted a series of flight tests after its completion and found that it took off readily and flew quite well indoors. Outdoors, however, it seemed to be deficient in directional stability. At this point he delivered the model to me for checkup and recommendations. It was measured up and the drawings made in the course of study and then—but here is where the soft music should begin to play, for my workship was burglarized in the dead of night and R.O.G.-1 was transformed from a prize winner to just plain loot never to be heard of again. Clues have failed, but I have always suspected that some over-zealous boy with a bad case of "sticky fingers" was the burglar. If it should ever reappear, we can complete our story but here's a better idea—how about building the R.O.G.-1 yourself?

These are good points to remember:

Can you define sweepback, stagger, decalage, wing cellule?

Can monoplanes have decalage?

Can monoplanes have stagger?

What is a good percentage of the total weight to allow for a rubber motor?

In what year did Professor Langley first succeed in flying his model driven by steam power?

Does the enclosing of the rubber motors actually aid efficiency? Cite examples.

SINCE the inception of our Junior Activities Department we have had an increasing volume of correspondence from readers. We have made a strenuous effort to give each personal attention but this is sometimes difficult. Right now we are snowed under! However, in order that readers generally may benefit by such correspondence, it is planned to print selected extracts from letters. This will be a regular addition to the Junior Activities Department appearing monthly. All are invited to write and we'll do our best to take care of the replies promptly.

TABLE NO. 2—Comparision of Powerplant Weight in Percent of Total Weight

Name and Type of Plane	*Total Weight (pounds)*	*Wing Loading lbs. per sq. ft.*	*Power-plant (pounds)*	*Per Cent of Total*
Professor Langley's first successful steam engine model—Tandem Monoplane, span 13 ft. (1896)	30		6.6	22
Mr. D. Stanger's gasoline engine model 4-cylinder engine, 8 ft. 2 in. span—from V. E. Johnson's "Model Aeroplaning"..	21		5.5 (complete)	26
Typical OX-5 engine—3-place biplane....	2,000		400 (without fuel, etc.)	20
Arthur W. Judge Handbook—220 h. p. 2-place biplane	2,426	6.95	670 (without fuel, etc.)	27
J. C. Hunsaker—125 h. p. Typical military airplane	2,436		635 (without fuel, etc.)	26.1

Pennies and Penny-weights

(*Continued from page 60*)

engineer who has appreciation of the refinements by which aviation progresses. There is a vast difference in viewpoint between pennies and penny-weights. The automotive engineer invariably thinks of the first, whereas his aeronautical brother has focused his mind too long on the latter.

When Langley said that a satisfactory aircraft engine might burn gold so far as he was concerned, he spoke as an investigator and not unreasonably.

The engine made flying possible. Naturally, it long occupied first place in every aeronautical development project. But, today, it is no longer a question of making flying possible; our task is to make it commercial.

Because development, production and merchandizing have already been perfected for motor cars, aviation has hoped to parallel that course. And since engines, aeronautical or vehicular, are sisters under the skin, designers of aircraft have sought the solution of power problems in the field of automotive endeavor. The search has not been without its disappointments, for car manufacturers—especially the successful ones—have had their hands fully occupied with car production and the essence of that resides in single-purpose equipment.

In aviation's search for engine help, it has overlooked the fact that another branch of the automotive industry has offered even greater possibilities—the body business. Engine equipment is inflexible; body equipment, on the other hand, is too large and expensive to be made single-purposed. Many years will pass before any aircraft company could hope to justify the installation of presses such as are now operated by the average automobile body plant.

The aeronautical engineer naturally designs within the limits of the production facilities at hand. So far, he has had to overlook the possibilities which lie in large sheet metal stampings. Metal planes are no novelty, and the trend toward "all-metal" is clearly indicated. It calls for courageous departure from precedence, but the goal is worth while—namely, an "egg shell" construction with a monocoque load-carrying skin.

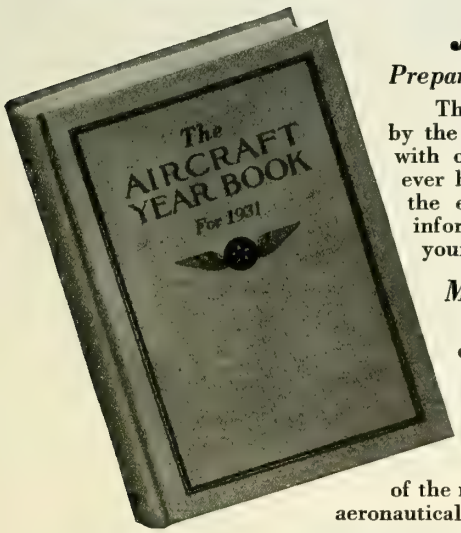
To carry this idea into aircraft practice requires a mutually appreciative cooperation, not only with a view to technical advancement, but in consideration of economic necessity. The large body plants have their presses paid for; they have developed a technique which has been even more costly. The little extra business which aviation has to offer, at least reduces overhead, and the automobile man knows his pennies. He knows them so well that he sees no inherent reason why planes should not eventually sell for less money than automobiles.

Keep Your Knowledge Up-to-Date

Your Job is a Part in a Great, Rapidly-Growing Industry

TO use your technical knowledge most efficiently, you must keep it up-to-date. Whether your interest in aviation is that of pilot or mechanic, student or airport operator, you are not doing your work with 100% efficiency unless you keep pace with all that is happening in the many departments of the aviation industry. There are new kinds of planes, engines, and instruments, even new plans for airports. There are new transport companies in operation, flying greatly extended routes; the service operators have developed new kinds of activities. This is the kind of information you must have to progress most rapidly and to be most valuable to your organization. You can have all this information at your finger tips in

THE AIRCRAFT YEAR BOOK *for* 1931



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Names of Sections

What's Ahead for 1931; *Indices to Progress in* 1930; *Over the Nation's Air Lines; Latin America by Air; Projected World Airship Services; A'Wing With the Army Air Corps; With the Navy's Flying Fleet; History Making Flights of* 1930; *Manufacturing American Aircraft; Producing American Engines; Preening Wings of Commerce; Air Terminals on Land and Sea; Airplanes: Jacks of All Trades; Aviation in School and College; Wings for Women; The Lawmaker in Aviation; World Aviation in* 1930; *Out of the Engineering Laboratory; Aircraft and Engine Design Section; Chronology; Appendix; Trade Index; Index.*

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THE TRAFFIC OF TOMORROW

(*Continued from page 38*)

vicious to say that certain things will come to pass simply because it would be very exciting if they did.

This mode of thinking for tomorrow is by no means confined to aviation. It is, indeed, a human weakness. It is a return to the mental habits of childhood and we all fall for it now and then. A small boy sits in the sun and imagines what he would do if he could jump a mile, or strangle two tigers and an elephant with his bare hands, or discover a gold mine in the back yard. First he assumes an impossibility, and then he figures out all its reasonable consequences.

This does a boy no harm, because he will shortly be called in to wash his neck and eat supper, whereupon he will forget all about his daydreams. His elders, however, should know better. They should not suppose they are thinking and talking reasonably if they begin with an absurdity or an impossibility. It is a favorite diversion of older folks, for instance, to decide exactly how wisely and well they would spend a million dollars, if they had a million dollars. Unfortunately the best intentions in the world don't change the fact that they haven't got a millon dollars, nor make it any more likely that they will get a million dollars.

In respects to aviation, I invite your attention to a typical example of sloppy speculation, which has nothing much the matter with it except that it begins with a preposterous impossibility. In the alleged comic strips, in some stories and novels, and even in more serious writing you will discover now and then the assumption that man is about to discover how to get around the law of gravitation. He is going to invent or devise something that will shut off gravitation as a window shade stops the sunlight. When this little trick has been attended to, the rest is even simpler. Aircraft will fly without fuel, visit the moon and stars, and become amazingly efficient and useful contraptions.

So, indeed, they would, if the trifling detail of eliminating gravitation were attended to. The argument of these romances is perfectly reasonable and logical and therefore plausible, except for the unimportant assumption with which it begins. That is silly. But if you don't mind a little silliness to begin with, you can go a long way with this sort of speculation. Unfortunately this is very much like climbing a ladder with all the bottom rungs missing. Or like jumping over the creek that is ten feet too wide for a single jump. You might be able to make it with a couple of jumps, if somebody would explain how to jump twice in a non-stop crossing. Otherwise you will get all wet.

The point of this parable is that too much talk about tomorrow is based on an absolutely unscientific hypothesis. It professes to be scientific, it exalts the ability of science to work miracles, it foresees a world in which science will be supreme. But it begins its argument with a contradiction of science, for science is only the organization of experience and most of these pipe-dreams are way ahead of experience. Most of them begin by supposing something discovered or invented that has never been hinted at by previous aeronautical experience.

Or else they begin by assuming that because a certain thing is desirable, therefore it will be done. It has been pointed out, for instance, that it would be nice if the fuel for a transcontinental crossing could be carried in the pilot's pocket or in some other small and convenient location. Admitting this, the next step in the argument is that radium or atomic energy or some undiscovered fuel may make it possible. If so much is granted, we are on our way to a fantastic future whose marvels are limited only by the imagination and impudence of their journalistic inventor. Meanwhile science sits sadly by, trying to tell the world that nobody has yet made radium or atomic energy turn a single wheel and that you can't burn a fuel which hasn't been discovered yet. But the readers of the Sunday supplements won't listen.

There is romance in science, but science itself is realism. It looks ahead, of course, but it keeps its feet on the ground. It goes ahead, but only from one certainty to another. It builds for tomorrow, but only on the facts of today. And it is unwilling to admit that anything is probable in the future that is obviously and fundamentally impossible in the present.

There ought to be a law. Nobody should be allowed to write on the future of aviation without including at least one-half of one per cent of sound aerodynamics and sensible aeronautics. Anyone telling tall tales of tomorrow should be sentenced to six months hard labor in the design department of an airplane factory, trying to put another ten miles an hour on a fast plane by reduction of parasitic drag. Anyone found ignoring the eternal laws of physics and mechanics should be made to learn by heart the lift coefficients of all known airfoils and a complete set of logarithmic tables. Anyone caught romancing about long-distance airliners on a 1,000-passenger scale should be required to serve time as traffic manager for a transport service, to the complete satisfaction of the stockholders, the public and the Department of Commerce. Anyone imagining the sky filled with fool-proof airplanes should be made to build one and fly it through a thunderstorm.

If these minor regulations were enforced, with a life sentence to silence as a penalty for fourth offenses, we might find time and patience for reasonable anticipations of the traffic of tomorrow. Some things are already certain in regard to it, for they are lessons learned by past experience.

One is that progress in any particular direction begins to slow up after a while and at last reaches a limit. It is not necessarily a mechanical limit, but is likely to be a limit of efficiency. The practical pace of motorized traffic, for example, is not determined merely by motors, but by a dozen factors that keep the pace of highway travel more or less static. The same is true of travel by rail. Trains could make sixty miles an hour or more a generation ago; they still loaf along as a rule at an average of about thirty miles an hour. In some respects, of course, limits of speed are absolute. The pace grows swifter in the middle stages of development and then the increase tapers off to nothing. It is comparatively easy, for example, to improve a runner's speed until he can run a hundred yards in eleven seconds; it is hard work to get him down to ten seconds flat; it is apparently impossible to make him run the distance in nine seconds. The same is more or less true of transportation by machinery.

Other examples of limits to aeronautical progress can be found in respect to payload, operating efficiency and economy, and the burdens of responsibility which can properly be placed on the pilot. Such limits are not reached yet, but some of them are in sight. In looking forward to tomorrow we have no business to ignore them, nor even to suppose that something will turn up out of nowhere to make them unimportant.

Then there are certain limits which seem to be inherent in the various types of aircraft. A favorite fallacy of avia-

(*Continued on following page*)

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(*Continued from preceding page*)

tion's prophets is to expect to too much of the future flying machine. But the airplane is a law-abiding piece of machinery, and its range of performance and usefulness will always lie somewhere within the law by which it flies. Because you can back up a horse, it doesn't follow that you can back up an airplane, though this might prove a useful maneuver on an overcrowded airway of tomorrow. An airplane flies because it is built to obey the laws of aeronautics. It would be nice if the forecasters could be persuaded to do the same.

The scope and scale of air traffic will grow steadily and surely, though less spectacularly than at some periods in the past. Aircraft will fly faster, function better, and fit more usefully into the general scheme of transportation. They will not, however, displace any existing transit system, but will supplement them all and increase their mutual efficiency. That also is a lesson to be learned from experience, for no sound transportation utility has ever been put out of business by another. Not even the horse is obsolete, and a good pair of feet are still serviceable for transportation purposes. Coördinated transport is tomorrow's traffic scheme, as may be illustrated more or less by recent developments in aerial express. A package in a hurry is likely to move from here to there in a variety of vehicles, among them the airplane. In a little while the airship will also be contributing to the complex organization of modern communications, so that a shipment may start on a camel's back in mid-Asia, go by rail to a trans-ocean air terminal, cross the sea in the sky, be transferred to airplane express, and arrive at its desination at last in a delivery truck or on a messenger boy's bicycle.

So we return at last to the problem of the prospective engineer, who wants to know whether aeronautics will be a clean, respectable and profitable business in 1938. We promise him that there will be no profound difference in his chances seven years from now. There will be more engineers in the business, of course, but there will be more problems, both theoretical and practical, to keep them busy in wholesome competition. Brains will still be worth their price in 1938; training and experience will be still be a profitable advantage in a trade that demands technique and practical knowledge; aviation will still have plenty of room for progress and plenty of opportunities for the right sort of men. It will be a good business, indeed, for a likely lad with energy and ambition.

And no doubt the jerk-water journalists will still be inventing in 1938 their lunatic sky-scenes of the future, full of wings, windmills and wonders, but carefully omitting the elements of common sense and science. Fortunately aviation does not need to trust them to create its future, and eventually the public will distrust and discredit them in favor of a practical understanding of what aircraft are good for. Eventually it will be recognized that the only true prophet is the sober scientist and the only trustworthy analyst of aviation's practical possibilities is the aeronautical engineer.

MATHEMATICAL WING SECTIONS

(*Continued from page* 51)

"M" sections. First, however, we must consider mathematical wing sections belonging to quite another class than the "M" sections.

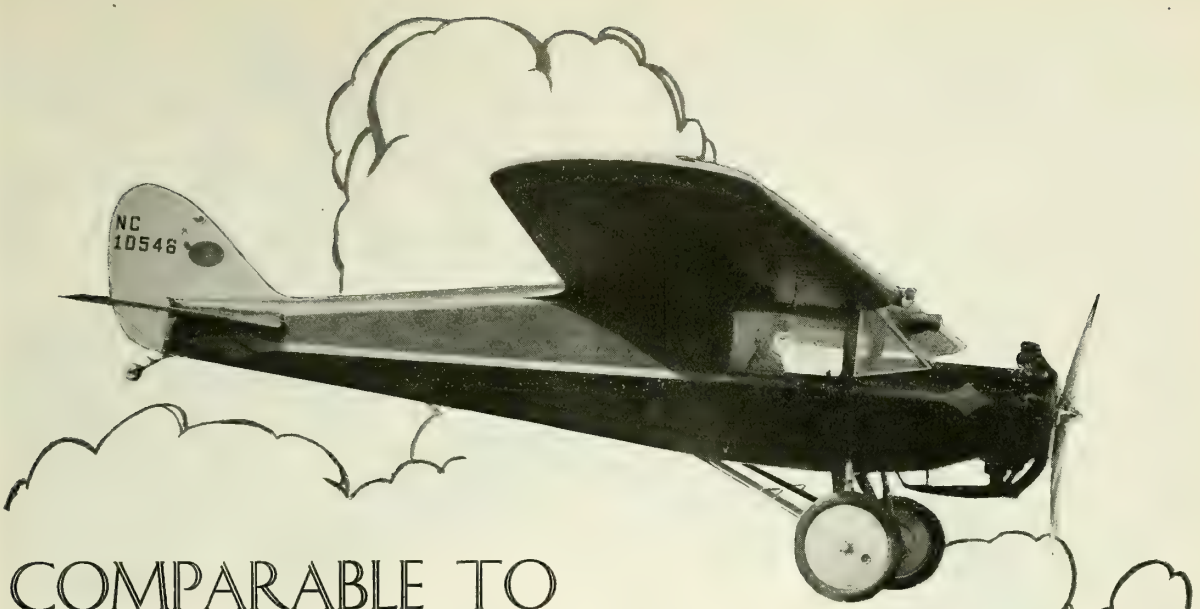
These wing sections have reference to very special mathematical processes, and may be called theoretical wing sections, as distinguished from practical mathematical wing sections. Chief representatives of this class are the Joukowsky sections. These sections have obtained much more publicity than they deserve. They came into existence when the general and universal wing section theory discussed in these articles was still unknown. Certain mathematicians tried to fill the gap by special wing section theories, which are mathematical processes for the computation of potential flow and its air forces acting on certain very special classes of mathematical wing sections specially invented for that purpose. Instead of fitting the shoe to the foot, the foot was fitted to the shoe. The mathematicians were successful in discovering wing sections that fitted the then-known methods of computing potential flow. This fitness (the adaptability to special and difficult mathematical computation methods, yielding the potential flow though not actual air flow) is the only distinguishing property of these theoretical wing sections. Individual theoretical wing sections may or may not be good sections; that is a question entirely by itself and has nothing whatsoever to do with their theory. Their potential flow can be computed exactly—although not particularly conveniently—and that is all.

Such sections were much discussed in technical literature of the time. But the discussions were confined particularly to the simplest class of such curves looking somewhat like real wing sections. These are the Joukowsky sections, named after their discoverer. Whole magazine pages were covered with mysterious mathematical symbols, which were largely unintelligible. Confusion reigned. The mistaken view became prevalent that the wing sections in question had some favorable aerodynamic properties, or that they were particularly efficient; and that misunderstanding has not been entirely overcome yet.

For comparison, let us consider a bridge structure. Because the stresses of a bridge can be conveniently computed it does not follow that that bridge is necessarily the best or cheapest structure. Convenience of construction counts much more than convenience of computation. With the Joukowsky sections the mere possibility of the computation of the potential flow—it can hardly be called convenient—is of even less value. It does not refer to the actual air flow, but to the academic potential flow; it does not refer to lift and drag, but merely to the distribution of lift and center of pressure travel. The fitness for such computation is hardly an asset at all, and by itself does not recommend any wing section. There are, indeed, some Joukowsky "wing sections" belonging formally to that class which are in fact not wing sections at all. A plain circle is a special case of the Joukowsky contour, but that fact in no way makes it a useful wing section. Some Joukowsky sections happen to be fairly efficient wing sections from the pure aerodynamic point of view, but none of them is excellent from all points of view. Joukowsky sections are not practical. Their drawback is their thin trailing edge. There is not enough height to accommodate the rear spar. Some high-lift Joukowsky sections suggest themselves for one-spar glider wings, although their center of pressure travel is greater than it should be; moreover, better sections exist for the same purpose.

Under these circumstances, the Joukowsky sections should be left to the mathematicians for pleasure and practice. Theoretical sections are, of course, at the same time mathematical sections and, as such, have in common with ordinary mathematical sections the advantages of regular shape and ease of classification. These two advantages should, however, be combined with efficiency, fitness for structural requirements, good stability and simplicity of mathematics, rather than with features inviting the compu-

(*Continued on following page*)



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(*Continued from preceding page*)

tation of the academic potential flow. The Joukowsky sections do not comply with the desiderata enumerated and are therefore unsuitable and unpromising for systematic research work. They should not be chosen in experimental wing section investigations made for breeding better sections.

It seems strange that, nevertheless, the Joukowsky sections have, in past years, been chosen for that purpose by the Göttingen Aerodynamics Laboratory. Accordingly, the practical result was zero. We in America started out with better promise in choosing the "M" sections for such research. The first series yielded superior sections now in practical use. The research was then interrupted, but it is hoped that it will be taken up again for the promotion of the entire industry, not of pure science only.

In the case of sufficiently simple mathematical wing sections, the summation of the guiding effects of all wing elements can be determined analytically—that is, by means of written mathematics—instead of using the graphical methods, the simplest case of which we have described.

In mathematics, a sum of very many very small contributions is called an integral. Accordingly, with simple mathematical sections, the determination of the average direction and of the symmetric direction is performed by integration. (The two integrals occurring are named for the author of this article, who discovered them and the general wing section theory.—Editor.) It is worthy of remark that these same integrals can also be used for the theoretical investigation of flaps and control surfaces. A stabilizer with displaced elevator is equivalent to a wing section with a mean camber line consisting of a broken straight line. When the stabilizer is parallel to the motion, only a part of the wing elements have a positive local angle of attack. We conclude that the lift of such a wing section is less than that of a section with unbroken straight mean camber parallel to the elevator. The ratio of the two lifts is not, however, proportional to the reflected areas, but the lift is proportionately larger with the stabilizer, because the guiding power of the rear wing elements is greater than the average guiding power of all elements. With an elevator chord of 50 per cent of the entire chord, for instance, the computation gives 85 per cent rather than 50 per cent of the lift of the unbroken wing parallel to the elevator. The simplified graphical method discussed in the sixth article of this series gives 100 per cent. This method is suitable for conventional wing sections only, and requires refinements in order to take care of wing sections with broken mean camber lines.

The mathematics of theoretical wing sections is over-developed, difficult and of little practical value. Its literature, though comparatively extensive, is out of date. Future contributions to it will be out of date before they are written. The theory of simple mathematical wing sections is, on the other hand, within the reach of the average engineer. It is easy; it is of decidedly practical use; and it will become of more acute interest in the next few years. Simple mathematical wing sections are destined to play an important part in experimental wing section research, and hence also in praxis. Their theory and mathematics are secondary to the broad principles of aerodynamics, but they are a handy tool for the skillful designer. We intend, therefore, to discuss this subject in fuller detail in the next article of this series, and this will give us at the same time a good opportunity to practice the application of the general wing section theory to special cases, and in that way to become more familiar with its principles. Accordingly, the next article will be devoted to the "M" sections. After that, we can take up lateral wing flow, and can combine it with wing section flow in order to obtain a complete picture of wing air flow and its forces. In that way, we are definitely approaching our final aim: the discussion of design questions in the light of theory.

This is the ninth of a series of articles by Dr. Max M. Munk. *Copyright* 1931. *All rights reserved by the author.*

FIVE YEARS OF NAVAL AVIATION

(*Continued from page 37*)

ner a Reserve of well qualified personnel is being developed and established.

In 1925 Marine Corps aviation had forty-three naval aviators, twelve aviation pilots, two student naval aviators, seven student aviation pilots. At the present time there are eighty-two naval aviators, eighty-four aviation pilots, twenty-eight student naval aviators and twelve student aviation pilots.

Four aircraft squadrons of the Marine Corps have seen active service during the past five years. Two of these were attached to the Third Brigade Marines in China and the other two to the Second Brigade Marines in Nicaragua. The China squadrons have been withdrawn, but those in Nicaragua still remain in that country.

The squadrons on expeditionary duty in China rendered valuable aid in furnishing artillery units with air fire control and the infantry with infantry liaison and contact. In addition air-ground communication by the Peiping and Third Brigade was maintained by these squadrons and the Brigade Commander was kept well informed of the Chinese military situation at all times by means of close and distant reconnaissance flights. Routine mail trips were made and mail service to vessels of the Asiatic Fleet was furnished upon request. Mosaic maps and military photographs were made for the use of the Brigade which would have been of untold value in case of actual hostilities. In carrying out the various measures assigned, the planes attached to these squadrons flew 2,455 hours—a total of 3,818 flights—without a single accident even though the planes were hit seven times by hostile fire.

Since November, 1927, the Marine aviation squadrons on expeditionary duty in Nicaragua have been engaged in operations against hostile bandits. These operations have been conducted more than a hundred miles from the base airdrome over a rough and very wild, jungle-covered country. The services rendered were without precedent in military operations.

Every ground patrol that was sent out had its aerial support planes. These were two in number, each armed with machine guns and bombs. The troop commander, because of the nature of the terrain, depended upon these planes not only to control, to maintain contact with and to receive daily reports from these patrols, but also to furnish them with medical and other emergency supplies, to provide them with adequate information about the location of the bandit troops and trails, and to provide them as well with the necessary combat support.

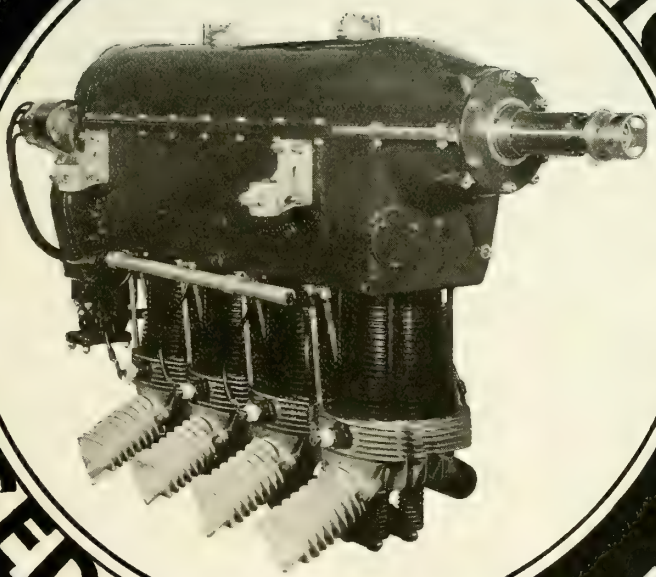
In the matter of air transportation great quantities of provisions, supplies, arms, ammunition, medical stores and articles of every description have been carried by the military squadrons in Nicaragua. Because of the lack of roads, practically all the garrisons depend wholly upon aerial transportation for the delivery of their mail. During the last year, more than half a million dollars in cash has been carried to pay the scattered troops, all of it being dropped to the various detachments without the loss of a single penny. Many times when the military situation demanded it, small detachments with all their arms and equipment have been transported by air. In carrying out these numerous missions, the planes of these squadrons have flown 1,420 hours with a total of 12,589 flights since November, 1927. They have transported over 5,000 passengers by air

(*Continued on following page*)

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(*Continued from preceding page*)

and more than 2,000,000 pounds of freight. Ninety-one contacts with bandits have been made and the planes have been struck eighty-six times by hostile fire.

The total annual aircraft operating time of all Navy and Marine Corps activities has increased from 63,791 flying hours in 1925 to approximately 264,655 flying hours for the fiscal year 1930. The total annual operating time per naval aircraft has increased in this period from seventy-four hours to 193 hours. The total aircraft operating time per pilot has increased from 104 hours to 273 hours. The total aircraft operating time per fatality has increased from 3,190 to 14,703. The number of aircraft operating at sea has been increased from 168 to 465.

The use of aircraft within the Navy has been recently demonstrated by the sending of 247 planes of all types, including fighters, observation planes, torpedo and bombing planes and patrol planes with the Fleet on its annual maneuvers. In one Fleet problem approximately 237 planes took part and in the entire winter maneuvers there was no loss of life or injury to personnel.

Five years ago tactical conceptions regarding the possible applications of aircraft were hazy. The optimistic viewpoint assumed by aviation personnel very naturally appeared somewhat ambitious to those not too familiar with this new weapon. The control of gun fire was in fact the only function which had been successfully accomplished for the Fleet. Today, through the advent of the carriers, the perfection of the catapult, and a thorough investigation of aircraft tactics by means of air concentrations and otherwise, we are able to send out with the Fleet for operations on the high seas aircraft to gain and maintain control of the air, to protect other aircraft and surface craft, to direct and spot gun fire, to deliver major attacks with bombs and torpedoes, to scout, to reconnoiter, to lay smoke screens and to deny air spots to the enemy.

The airplane has proved in naval operations to be at once a vehicle, a high observation post, a gun, a torpedo projector, a depth charge projector, a mine layer and a smoke screen layer. Research and operations with the forces afloat during the past five years have proved that the applications of aircraft parallel the functions of practically every other arm of the Fleet and, considered in whole, the application of aircraft to the above functions has greatly increased the four primary requisites so essential in the composition of any Fleet, namely, rapid and reliable communications, mobility, armament and protection.

Our present 1,000-plane five-year building program, which was adopted by Congress at the recommendation of President Coolidge, was of invaluable assistance to aviation. It enabled commercial industry to foresee prospective demands from the Navy, one of its two biggest purchasers, covering a period of five years, and it enabled the Navy to foresee the rate of expansion and improvement which was to be anticipated. This plan proved a valuable stabilizer on industry and assisted materially in its development. At the same time the Navy was enabled to go about the development of its aviation in an orderly and progressive manner and to insure that the endeavors of one year were not frustrated by lack of funds during the following year. Much of the progress and fundamental soundness of present naval aviation should be attributed to this carefully laid out building program. It is to be hoped that another program will be laid down in time to assure continuity of effort and steady further improvement.

RUNNING A FLYING SCHOOL

(*Continued from page* 49)

number, engine ground hours, engine air hours, hours since engine overhaul, total engine hours, total airplane hours, hours since last airplane overhaul, hours since last check, hours since oil change, date and remarks.

All material and supplies needed for any job are issued on requisition. These forms describe the supplies, their specifications, quantity and so forth, and must bear the signature of the chief of the department for which they are requisitioned. No issue is made from the stockroom unless this form is properly made out. If the required material is not in the stock the purchasing agent is given a written order to obtain it.

The student contract contains a mutual agreement in which the student is released from liability for damages to airplanes and other property, in return for the school's immunity in case of personal injuries. The school also agrees to furnish flying suit, helmet, goggles, text books and other necessary articles for the course chosen. An enrollment notification, with information about the student, is made out and filed with the registrar for reference. The newcomer is given an enrollment identification card and started on his studies.

Student record cards are kept in both ground school and flight training divisions, to be totaled weekly to trace the progress of the student. At the end of each lecture course, shop work or flying course, the hours and grades are totaled and put in the permanent student records which are retained by the school and used to furnish information for Department of Commerce forms.

Certificates are issued students upon the completion of courses. One is given for the ground school division, and another for the flight training division. On the face of the certificate it is set forth that the student has completed the course for which he enrolled. The reverse side contains a list of all subjects in the course taken, with total hours and grades in those subjects required for the course. If he attains a grade of over seventy in all subjects, each student in flight training is awarded a diploma signed by the school officials.

Records pertaining to flying students' time are kept on the flight record chart, the students' solo card and the dual instruction card. The flight record chart, kept in the flight office, is a large chart with all flying students listed on it in numerical order from top to bottom along the left margin. Guide lines extend from these numbers across the chart to the right margin. Across the top are numbers running from one to two hundred, indicating the number of hours of flying each student is to take. A continuous line across the chart from the student's number indicates the number of hours flown daily. A red line is used for dual flying and a blue line for solo flying. The total number of hours also are divided into primary, intermediate and advanced stages of flying. The advanced stage is further subdivided into time in small cabin planes, large cabin planes and night flying.

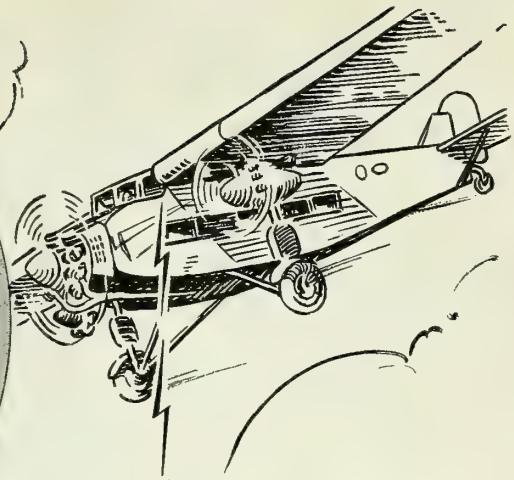
When a student pays all or part of his tuition fee, a red pin is placed on the flight record chart under the total number of hours to which he is entitled. In cases of part payment, when the red-blue line approaches this pin the accounting department is notified that further payment is due. When this is received, the pin is advanced to the place denoting the additional number of hours paid for.

This chart also serves as a visual record for the flight training division, so that it may regulate each student's progress in a systematic way. By use of a blue pin on the line, the chief pilot may keep his eye on check hops and the number of hours of dual instruction, advanced aerobatics, night flying and so forth, for the individual student.

The student's solo card contains his orders for the day. All maneuvers and types of flying required for the course

(*Continued on following page*)





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Like other B. G. spark plugs, the new radio shielded plug is insulated with mica—the superior insulating material.

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The Hornet size B. G. radio shielded spark plug has an overall length of 3" from cylinder gasket seat, and weighs only 3-1/16 ounces complete with terminal.

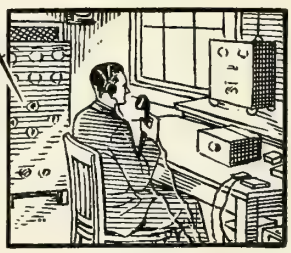
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CONTRACTORS TO THE UNITED STATES ARMY AND NAVY

(*Continued from preceding page*)

are listed on this card. The chief pilot merely has to place a check mark opposite those the student is to practice that day with a notation as to the locality of the flight. A place is provided for the student to record instrument readings observed during the flight and the condition of the plane. After the flight the student certifies with his signature that he had performed the required maneuvers.

The dual instruction card is kept in the plane for the instructor to write in, opposite students' numbers, the time of each instruction flight and other remarks. This card serves as a double check each night, when the accounting department uses it to total student hours and as a basis for figuring the hourly bonus pay for the pilots.

Minor forms such as are common in good business practice are used at Airtech. All the information derived from these various sources is totaled at the end of the month by each department and turned in to the accounting department. Totals are made to determine the cost of operation.

The first cost is the cost per flying hour which is computed by adding the cost of gasoline, oil, mechanical labor, materials and supplies, depreciation on airplanes and engines, airplane insurance and the pilots' bonus for flying time. This sum then is divided by the total number of flying hours for the month and the result is the cost per flying hour.

The second cost is the fixed monthly overhead, determined by reducing all fixed costs to a monthly basis. This includes field rent, salaries, office overhead, wages, insurance, depreciation on fixed assets, and so forth.

The ground school runs as a separate unit. Salaries of instructors, the cost of supplies and materials, and office overhead are charged against the income derived from ground school students. Small items such as telephones, lights and postage are divided equally between the ground school and the flight training divisions.

All of these totals are used in figuring the monthly profit and loss statement. This is compared with the statement of the preceding month and also for the same month of the preceding year. These figures serve as guides in preparing a budget, and constitute a business barometer in laying a course for future policies, expenditures and improvements. In the preparation of budgets, the general activities of the aviation industry as well as business in general must be anticipated, all these things having a direct bearing on the future success of aviation schools.

THE PILOT AND HIS ALTIMETER

(*Continued from page* 47)

.10 inches of pressure equals 180 feet.

True elevation at El Paso	3,900 feet
Pressure correction	180 feet
Set altimeter to read	4,080 feet

In practice the setting would be 4,100 feet.

If, after making this adjustment for pressure variation, we desire a more accurate indication of the true altitude at any moment during the flight than is obtainable from the indications of the altimeter, we must apply a correction for variation from the standard air temperature of 50 degrees Fahrenheit. Since this correction is based upon the *average* temperature of the entire column of air between the plane and the ground, the pilot must be provided with a thermometer to indicate the temperature at the flight level. In practice this is generally done by attaching a thermometer to the side of a strut well clear of the heated gases from the engine exhaust. The pilot, by averaging the indication of his strut thermometer and the ground temperature, obtains a rough estimate of the average temperature of the column of air beneath him. The difference between this average and the standard temperature of 50 degrees Fahrenheit is called the temperature difference. This figure, multiplied by twice the altitude expressed in thousands of feet, gives the correction in feet to be applied to the altimeter reading. If the average temperature is greater than 50 degrees Fahrenheit, the correction is added to the altimeter reading; if below 50 degrees Fahrenheit, it is subtracted.

For example, the ground temperature is 60 degrees Fahrenheit. The strut thermometer reads zero. The altimeter reads 7,500 feet. What is the true altitude?

Ground temperature	60
Strut thermometer reading	0
Average temperature	30
Standard temperature	50
Temperature difference	20

Correction equals $20 \times 2 \times 7.5$ or 300 feet.

Altimeter reading	7,500 feet
Temperature correction	300 feet
True altitude	7,200 feet

The rule just illustrated, though a rough one, is fairly accurate inasmuch as the theoretical error involved for an altitude of 20,000 feet and a temperature difference of 50 degrees is only 39 feet. For lower altitudes and smaller temperature difference this error is smaller. Pilots engaged in performance testing of aircraft, in landing at night or in thick weather, in aerial mapping, or in bomb dropping will find this means of correcting the altimeter reading invaluable. Pilots who do not care to avail themselves of this information should remember that the altimeter will usually under-read in summer and over-read in winter.

The reader has undoubtedly noted that as yet no mention has been made of the mechanical errors inherent to the altimeter. The reason for this is that, generally speaking, instrumental errors of altimeters designed since 1925 are—with one exception, and that of a transient nature—so small that they can be disregarded with safety by the pilot. Some authorities will disagree with this statement and will mention the fact that the pressure within the cockpit or cabin of a plane may differ considerably from that of the exterior air and that the altimeter indicates an elevation corresponding to the cockpit pressure rather than that which relates to the true pressure at the altitude. Some even go to the extent of advocating a connection between an airtight altimeter case and the static head of the air speed meter system. C. J. Stewart, in the book "Aircraft Instruments," states that by this method the error attributable to the cockpit effect, which has been found to be as great as 150 feet, is reduced to about 30 feet. However, if the pilot makes the necessary pre-flight setting on his adjustable knob while warming up at full gun, the slipstream from the propeller will produce a relative pressure effect within the cockpit or cabin closely corresponding to that which obtains during flight and the magnitude of this error will be greatly reduced. After all, this error is the result of the installation rather than any inherent defect in the design of the instrument itself and therefore should be made the concern of the aircraft designer, particularly where cabin jobs are concerned. So far as the pilot is involved, if the altimeter has reasonably free access to the

(*Continued on following page*)

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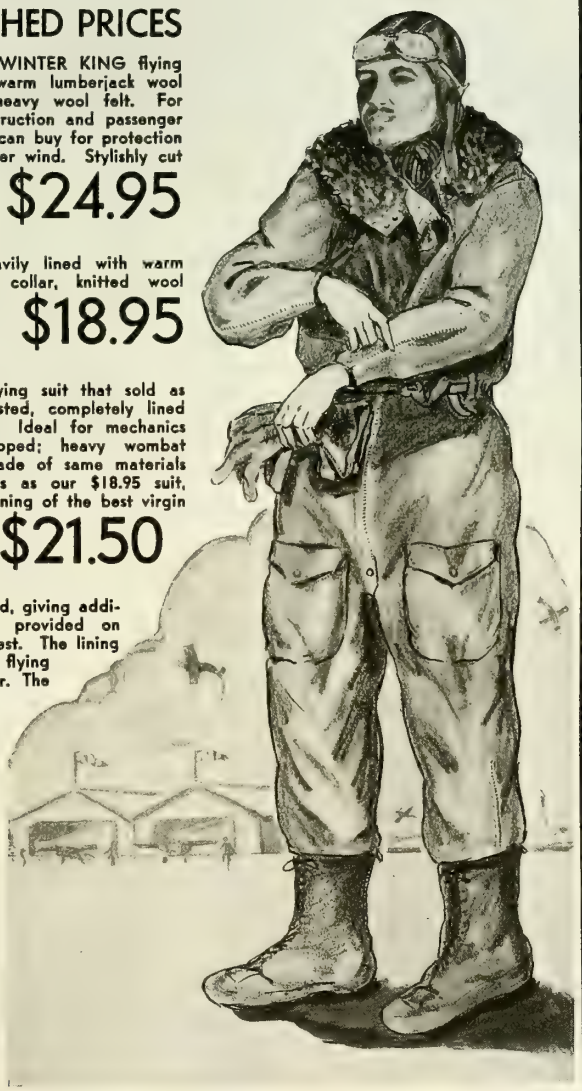
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(*Continued from preceding page*)

exterior air and if the pilot observes the suggested method of setting his altimeter during the warming up process, this error may be disregarded.

The single instrumental error of the altimeter that the pilot cannot afford to neglect is the one known as the lag. Because of the imperfect elasticity of the mechanism, the altimeter pointer will not, after a change and a restoration of the pressure, return immediately to its original position. This characteristic, which may be reduced to a very small amount by careful design and manufacture, is one that may cause serious trouble. If altitude is lost rapidly the immediate indications of the altimeter may lag dangerously. In addition, altimeters are usually provided with a small hole in the case by means of which the exterior pressure is transmitted to the interior of the instrument. If this orifice is even partially clogged with grease, moisture, or dirt, the effect of the lag will be greatly increased. As an illustration of these two points the following incident is related.

Back in 1921 a young student was practicing acrobatics in preparation for final qualification for his wings. The plane, in common with most training planes of that era, climbed slowly and lost altitude rapidly during each "stunt" even when the evolution happened to be performed perfectly. Consequently, a one-hour flight during which acrobatics were to be practiced consisted of about fifty-five minutes of climbing to altitude, four minutes of stunting, and one minute for the approach and landing. Consequently, altitude on such flights was at a premium and there was a distinct tendency on the part of students to squeeze in just one more nip-up. In the case now being considered the student climbed for altitude and began his tricks. After several maneuvers, all of which were undoubtedly accomplished in a most indifferent fashion, our friend saw that his altimeter read about 2,000 feet and must have decided that one more evolution would not unduly strain the rule forbidding the practice of acrobatics under that altitude. Accordingly, he blithely "pulled her back and kicked her" for one last split-S turn. It came near being the last he ever tried either that day or any other, for just as he regained air speed he came so close to striking the surface that children's hair still stands on end. The normal lag of his altimeter, which was much larger than that which may be expected in altimeters of modern design, had been accentuated by the rapidity with which he had lost altitude and also by reason of the fact that caked grease had almost entirely clogged the hole in the altimeter case provided for admitting the exterior pressure to the interior of the instrument. Although it must be admitted that this was an extreme case, the incident illustrates that pilots cannot afford to disregard the effects of the lag in altimeters. This holds doubly true where the pilot is making a night landing or is forced to land in thick weather or upon glassy water. In such instances, prudence dictates that the pilot should lose altitude more gradually than is the case during the normal glide in order to permit the instrument to adjust itself to the changing conditions.

Another thing that the pilot should remember in using the altimeter is that the instrument records altitudes above sea level and not the elevation above the terrain over which he may happen to be flying at the time. Such a caution may seem to be superfluous, but it is included for the benefit of the pilot who does most of his flying near the coast and flies inland only occasionally. Pilots who do a lot of seaplane work are apt to forget this point.

So far as the selection of an altimeter is concerned, the

(*Continued on following page*)



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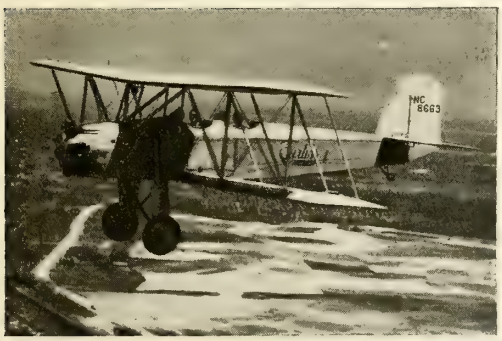
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(*Continued from preceding page*)

choice depends upon the type of flying the pilot undertakes. For routine operations the conventional instrument is adequate, but it must be a reliable one. Far too many aircraft manufacturers and pilots attempt to economize when it comes to instrumental equipment. For those so inclined here is a word of caution. It is a whole lot cheaper to equip with good instruments at the start than it is to have even a minor crack-up.

For such missions as aerial photography, bomb dropping and test work, the finest of precision altimeters are essential. Night flying might well also be included in this category. In the precision class of altimeters, some truly remarkable instruments have been placed on the market recently, the use of which should greatly facilitate missions where the attainment of an accurate altitude and its maintenance are important. But too much should not be expected of even these instruments. They have their particular field and they fill it admirably, but as yet no instrument sufficiently accurate to be used as a safe guide in blind landings has been developed. Furthermore, such considerations as the variation of the barometric pressure during the time of flight, variation of the gas constant, the deviation of the atmosphere from the law of an ideal gas due to humidity, the effect of the wind in modifying the normal static distribution of the pressure, the small correction for the changing effect of gravity with altitude, etc., seem to indicate that the development of an altimeter accurate enough for such landings will not take place in the immediate future.

So far as the maintenance of the altimeter is concerned, there is little that the pilot can do. He can only see that the mechanism for rotating the dial moves freely and that the small orifice in the case of the instrument is kept clear. Aside from this, pilots should remember that the altimeter is a precision instrument, requiring a very specialized skill for adjustment and repair, and that if one becomes erratic it should be returned to the manufacturer for examination.

AERIAL INVASION OF U. S.

(*Continued from page* 41)

harbors along the coast of British Columbia—a practically uninhabited region in most parts, and sparsely settled throughout.

AND what of our southern borders? Might any danger come from there if we became involved in a world conflict? Undoubtedly. Yet the average citizen probably would laugh at the possibility. Mexico, he would tell you, could not attack or destroy any American city in the southern part of our country. But Mexico could be invaded and occupied by a stronger power, which then would use that country as a base for airplane attack on Californian and Texan cities.

Suppose, for instance, that a power operating in the Pacific wanted to establish air bases within easy bombing range of Los Angeles, San Diego and other Southern California cities and towns. A glance at a map will inform you that the upper end of the Gulf of California is within 300 miles of Los Angeles—less than three hours for a bombing plane, and only two hours for a pursuit or attack airplane. Those parts of Mexico around the Gulf of California—the provinces of Sonora and Lower California—are thinly settled and entirely open to invasion by any power possessing sea transport. In the event of an invasion, Mexico herself would be unable to defend her territory, even if she wished to do so.

(*Continued on following page*)

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Left—The new Boeing-built flagship of the Standard air fleet, powered with three 525 h.p. Hornet motors. Above—Passengers at bridge in the richly finished cabin. Below—View aft showing another arrangement of seats, with passengers enjoying an amusement broadcast.



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WACO AIRPLANES

"ASK ANY PILOT"

1-2



(*Continued from preceding page*)

It might be argued that although our cities would be open to air attack the air bases of the invading forces also would be open to our reprisals, and that we could despatch air forces to destroy the bases. Such an argument, however, is absurd. The enemy base would be a bare field, with a few scattered buildings or tents, or possibly no buildings at all. Ammunition and supplies could be buried in the sand, or adequately camouflaged. And as for the invaders' airplanes, they could take to the air or move to other fields. The City of Los Angeles, however, could neither fly away nor burrow in the sand, nor could any of the other cities or towns in California. In fact, in the course of a single night it is easily possible to disembark a hundred or two hundred airplanes on the practically uninhabited northwest coast of Mexico, assemble and service them next day, and have them dropping bombs on San Diego and Los Angeles that night.

Not even land bases are necessary, however, for the initial attack. The planes could be despatched from aircraft carriers miles at sea, bomb our coast cities, and either return to the carriers or land in Mexico. In fact, this latter plan is probably the one that would be followed, for it is at once easier, quicker, and holds more of the element of surprise.

If this is true of Southern California—and to know that it is true you have only to glance at a map—what condition of possible air invasion confronts those cities in Texas, Louisiana, Mississippi, Alabama, and Florida? The northeast coast of Mexico, below Brownsville, Texas, is entirely undefended and open to invasion. Bases could be established from which raids could be made on Brownsville, Houston, Beaumont, and even as far as New Orleans. Aircraft flying from those bases and from fleet carriers could lay waste all of those cities with comparative ease—an operation very difficult, perhaps impossible, for land forces.

And what of the Panama Canal, without which we cannot move our battle fleet from the Atlantic to the Pacific, unless we voyage around the Horn? Is there any reason to suppose that a strong European nation could be or would be prevented from landing aircraft to be used against the Panama Canal? Suggesting for instance, that Nicaragua would offer objections to someone attacking our pet canal would be merely ludicrous.

IN articles that have appeared in AERO DIGEST during the past few years, I have discussed the bombing not only of our coast cities, but also of our inland industrial centers by aircraft dispatched from ships at sea, either converted passenger or freight ships, or aircraft carriers or other ships of an enemy battle fleet. So I shall not go into the matter again here, except to mention that it is one of the more obvious danger points in a future war.

General Italo Balbo's foray across the Atlantic with a fleet of ten aircraft is significant, not because of its immediate possibilities but because of what it suggests we may expect in the not too distant future, of mechanical improvements in equipment, more intensive training of personnel, and the normal advance in aeronautical knowledge that we may expect from year to year. It should also be borne in mind that this spectacular flight, partially unsuccessful though it was through the two accidents that marred the start, serves to center the attention of all nations on aircraft to an even greater and more thoughtful extent than it was centered before that flight. It is, in a most suggestive way, at once a glimpse into the future of flying and a bright light on the purposes and accomplishments of the

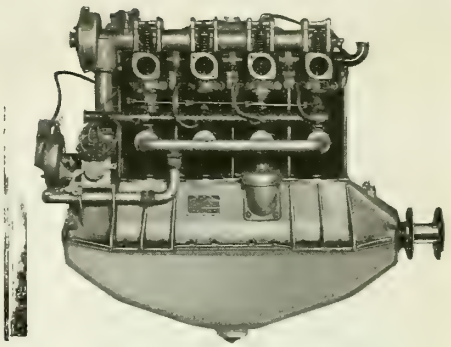
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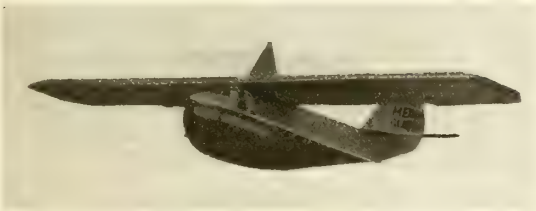
These engines will not last long at our price—so write or wire at once for our bargain price on one or a hundred—whatever number you can use.

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Four cylinders, vertical, water-cooled type. Bore 5¼ inches; stroke, 7 inches. Width overall, 18½ inches; length overall, 49¼ inches; height overall, 40 inches. Weight, 415 lbs. Equipped with two Dixie Magnetos; force feed lubrication. Normal r.p.m. 1450.

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(*Continued from preceding page*)

Italian people.

It serves to call attention again to the acknowledged fact that practically all wars have their inception in some economic need or condition, and that Italy, like other European countries, especially Great Britain, is sending commercial envoys into South American countries to stimulate and build up trade. This, in turn, leads to commercial rivalries and trade wars. The South American voyage of the Prince of Wales, like the flight of General Balbo, is a commercial foray; they are today playing the parts played by the German commercial traveler of thirty years ago. Truly, there is little new under the sun; names, titles, individuals change—but human purposes remain unaltered.

NOW, if you have followed me so far with understanding and even partial agreement with my observations, may I beg your studious consideration of what I present next. I am afraid that, even if you agree with me in general, you may feel that, after all, the possibility of our country's ever being invaded is slight. It is my purpose to show that, in our next major conflict with a power or powers of anything like our own strength, not only *may* we be invaded by air, but of necessity and for a certainty *we must be invaded*. In my mind there is not a question, not a shadow of a doubt, that in our next war aerial invasion of the United States will be an accomplished fact. And let me stress the fact that I have not arrived at this conclusion merely because I am an advocate of air power. Even without the perfection of aircraft, the theory of waging war would have changed, and would have continued to change, as it is changing day by day. But let us see when the change first was evident.

THE war of 1914-1918 demonstrated and emphasized the importance of two basic facts—the *mechanization of war* and the absolute dependence of the fighting forces on the *constantly continuing production* of the mechanical supplies and equipment without which the conduct of a modern war is impossible. Stop or even interrupt the flow of those supplies, and the war must of necessity cease.

Until 1914 this was not so, or at least not recognized as so to any important extent. In former wars, more limited in area, in numbers of men employed, and in the variety or mass of war equipment used, it was necessary only to equip navies and armies, send them to the scene of operations, and leave them to fight it out with the materials despatched to them. The manufacture of these materials—ammunition, guns, foodstuffs—was a comparatively simple matter that did not tax unduly the peace-time facilities of production that were diverted to war work.

In the last great war, however, all of this changed. The numbers of men employed made a very noticeable drain on the production facilities of the countries involved, even to the primary requisities of food and clothing—items which in all previous modern wars had been assembled with ease. In addition to these, which alone made a staggering burden, the war equipment became more costly, more varied, and much greater in mass. I have only to point to the thousands of airplanes that had to be manufactured, the more than 200 submarines constructed by the Germans, the hundreds of ships built by the Allies, the hundreds of armored tanks, the thousands of motor trucks, motor cars, guns of all sizes, ammunition, telephone and radio equipment, hospitals and hospital equipment, hospital trains, and so forth, to say nothing of luxurious cars for generals. The list of equipment required to prosecute a

(*Continued on following page*)

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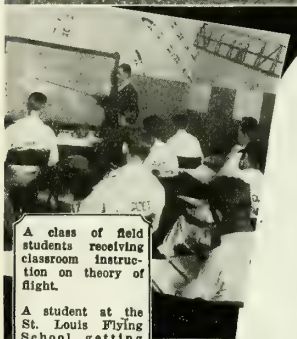
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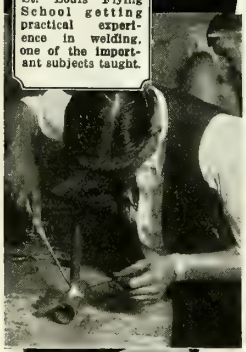


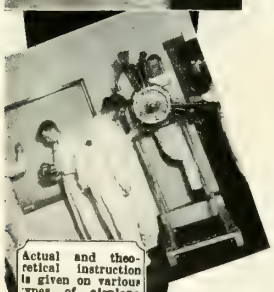
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P-1

(Continued from preceding page)

modern war could be continued for pages.

Now, all of this material—*without the continuing production of which the war must cease*—has to be manufactured in the homeland of the combatants, or be supplied by other countries. Therefore it is evident that the battle front of the nations has changed.

It has been said that aircraft have altered radically the methods of waging war. They have, but not to nearly the same extent that the complete mechanization of war has altered those methods. Even if airplanes had not been invented or used in war, the problem still would be basically the same—and that is *the problem of how to destroy or render abortive the enemy's efforts at home.* Even without aircraft the home front would still be as important as the battle front. The airplane simply turns out to be the logical weapon to use against the home front.

Today forward looking strategists are not concerned, as they used to be, solely with the problem of how to attack and defeat enemy fighting forces; they are concerned equally with the problem of how to dry up at the source the stream of war supplies without which the fighting forces of the enemy will be helpless. And it rapidly becomes more and more clear to those who study the problem that the cheapest and the most effective way to defeat an enemy is to disarm him or starve him.

It is conceivable that, even with a fully equipped army in the field, even with a navy adequate for coastal defense, so far as the opposing navy is concerned, even with a fighting air force equal to the enemy's fighting air force, the war could be lost by either opponent long before there was any possibility of their fighting forces being defeated or exhausted.

Let us suppose a disposition of opposing forces of equal strength, *but with one opponent having a reserve of aircraft sufficent to enable him to lay waste his enemy's cities, destroy his factories, his stores of supplies, his railroad terminals, his docks.* Let us suppose that his efforts were successful—as it is conceivable they could be—and that the civilian population were faced with the results of this ruinous form of warfare. Would the people at home want the war to continue or would they demand that their rulers sue for peace? Soldiers are disciplined, as civilians are not. They can be kept at war despite their desires; but can civilians be forced to fight on the home front when they see destruction and death brought to their own firesides? Perhaps so; perhaps not.

Never again, if an opponent can prevent it, will the United States be allowed to send troops across the ocean to do battle on enemy soil, or captured soil, while the United States itself remains peaceful and secure. We have no assurance that in the next war we will be so aligned with Allies that we outnumber our enemy. We have no assurance that the war will not be brought home to us.

If it is brought home to us, it will be brought by air.

From a national standpoint, there is reason to regard the subject with some concern—not alarm, I say, but concern. The problem should be studied by those officers competent to appraise it, and their recommendations should be listened to and acted upon by Congress.

A GLANCE at the map of the United States will show how inadequately we are defended against such attack as I have pointed out not only could be, but *would be, made upon us* in any war with a major power or powers. Note from the map how few are our Regular Air Corps stations and Navy fields. Do you believe those few fields

(Continued on following page)

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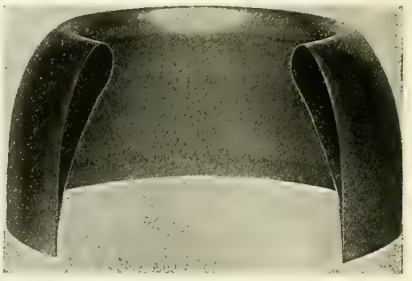
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(Continued from preceding page)

afford adequate defense? Or that our few airplanes could assure us of safety from attack?

In the opinion of the Army General Staff, all of the borders of the United States are now vulnerable to air attack. Major Horace M. Hickman, air officer of the General Staff, declared at a Washington meeting last summer that England could establish an air force in Canada within ten days, and that any foreign nation could land an enemy air force in Mexico and have it functioning in scarcely more time.

IT is not necessary to speculate blindly about the future in order to learn how we will be attacked. All that is needful is to examine the records of the last great war, study the obvious lessons taught by them, and from that basis predicate the future with little of speculation and much of certainty. If Germany, for instance, had been able to keep up and increase the production of new submarines to replace those lost or destroyed by the enemy, and thus had been able to accomplish successfully its destruction of Allied shipping, it would have been England, and not Germany, which was starved into defeat. Germany's was the failure, not of fighting forces, but of supplies.

Hence we draw the lesson that to defeat an enemy it is always desirable and often essential to destroy or hamper the forces of production to a point where the maintenance of an efficient fighting force will be impossible. Furthermore, this destruction will have the additional effect of undermining the morale of the civilian population.

TO many it may seem visionary to picture fleets of enemy aircraft flying over New York and dropping bombs. Yet that they flew over London, over Paris, over Brussels in the last war is a fact—a fact, as it were, of far lands, that many Americans accept with the remark, "Well, they couldn't do it here—there's the ocean to cross." If I have managed to convey even a suspicion that the ocean is not an insurmountable barrier to aircraft, I have at least accomplished something. And if I have managed to convey the thought that our political and geographical surroundings are not of themselves sufficient protection to our nation, more has been accomplished.

What is the solution of our problem? How can we assure ourselves of adequate defense against the air invasion that must certainly come when next we take part in a world war—and have no doubt that the next war of the great powers will be one where we cannot remain neutral. Is there any solution? I think so. And in an early issue of AERO DIGEST I shall discuss what I think is a way *toward* a solution.

A NEW HOMING DEVICE

(Continued from page 39)

It had to be absolutely reliable, its weight light, dimensions small, cost low, and adaptability such as to comply with radio equipment already on hand.

The homing device finally developed under the supervision of Mr. Herbert Hoover, Jr., chief engineer of Transcontinental and Western Air, Inc., consists of an indicator which is merely a galvanometer, the pointer of which, in its normal position, points straight up. To either side of this center position are letters *L* and *R*, indicating left and right. Below the indicator is the homing device which is in the form of an adapter and connected ahead of whatever radio receiver may be already installed in the

(Continued on following page)



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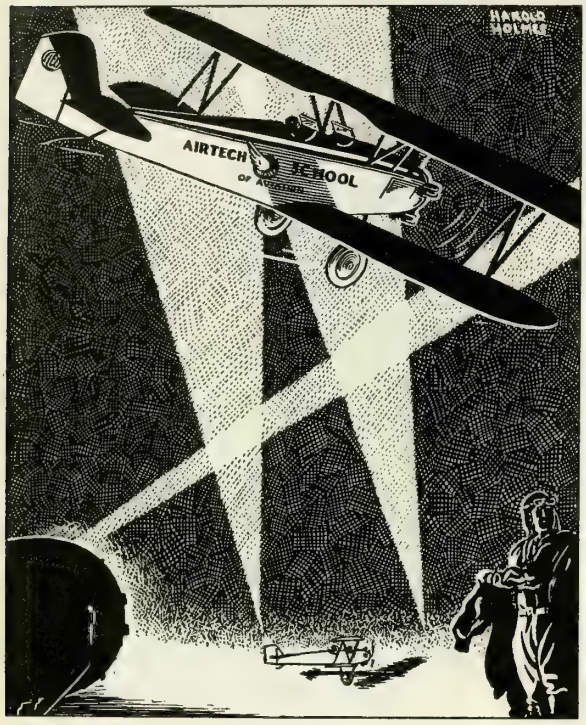
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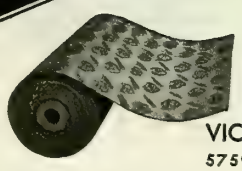
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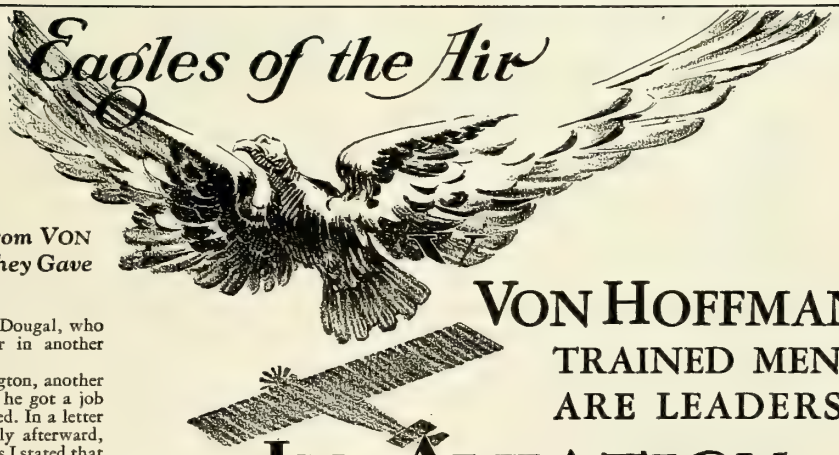
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(*Continued from preceding page*)

Police Commissioner in charge of the unit. Acting Captain Arthur W. Wallander is the uniformed head of the organization and Acting Sergeant Allen Van Hagen one of the chief instructors. From the beginning, Mr. Chamberlin has maintained a close supervision of the activities of the flying policemen and has endeavored with their officers intelligently to coördinate the work of this unit with other branches of the Police Department.

To this end a two-way radio telephone demonstration was aranged for the air cops on November 26, 1930, in coöperation with the Bell Telephone Laboratories, the planes used not only talking back and forth with each other but to Commissioner Mulrooney at his desk in headquarters via regular telephone wires and the experimental radio receiving station at Whippany, New Jersey. As a result plans are now being considered for equipping the Department's Loening amphibion with radio, which will be particularly valuable in the event that police automobiles and launches also are fitted with radio telephones. Through the efforts of the air cops the municipal broadcasting station, WNYC, now sends out a twice-daily report of local flying conditions for the benefit of aviators planning a trip to New York by air.

Some of the special missions undertaken by the air cops during 1930 were searching for lost fliers, scanning the waters in and around New York City for the bodies of persons reported to have been drowned and seeking to aid those reported in distress far from shore in small boats. In one instance a police pilot actually landed near a man who had fallen out of a small boat and saved him from drowning. There were at least two occasions on which this unit coöperated closely with the Detective Division in hunting persons reported kidnaped.

Perhaps the most interesting case of the year, from the point of view of immediate results, arose from the loss of a cylinder from an air-cooled motor flying over the city. The heavy fragment of metal plunged through a Harlem housetop, narrowly missing a woman and causing considerable damage to the building. The identity of the plane was a mystery, for witnesses said it had passed on out of sight. Almost as soon as the story of the accident was published one of the tabloids broke out with an editorial entitled "Where Were the Air Cops?" which soundly berated the flying police for not being on the scene when the motor failure occurred. The perfect sequel occurred next morning when two police fliers, on regular patrol, sighted a plane on the Welfare Island "farm," opined it was the clue to the accident of the day before and in short order cleared up what the surface police forces admitted must otherwise always have remained a mystery.

LIGHT PLANE COST PROBLEMS

(*Continued from page* 55)

be reduced principally to a number of stampings.

Flight instruction is another item which rightfully belongs under first cost and which must be paid for by the purchaser of the ship. The size of this item is important and generally it will be observed to decrease proportionately with an increase in the inherent stability, controllability and power reserve of the plane. The ideal condition for both manufacturer and purchaser would be such a drastic reduction in instruction time required that the salesman may be depended upon to instruct the purchaser gratis as an item of the contract. Planes that may safely be flown after one or two hours of instruction are needed. With one of these a salesman can give his prospect, say, one-half hour's instruction, as an effective demonstration of the safety and simplicity of his product. Much sales

(*Continued on following page*)

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(*Continued from preceding page*)

resistance will thus be overcome and we may confidently expect, within a very few years, to observe a salesman demonstrate to his prospect, close the deal and solo him within two or three hours. The only obstacles to this welcome improvement are simple design problems, and designers have been resting on their oars for so long that some valuable innovations are to be expected almost any day.

In the matter of fixed overhead, drastic reductions in the costs of housing are possible and necessary. The large amount of sail necessitated by the low wing loading of a light plane makes a folding wing arrangement imperative if housing costs are to be held within reason. This fact may best be realized when one recalls that on some of the larger fields, hangar space for a light plane will come to $30 or $35 per month, which means that the rental expense over a life of five years will total more than the purchase price of the ship. It appears safe to assume that within a few years all private and commercial ships under say 5,000 pounds gross, will incorporate folding wings for this reason of economy.

The housing cost of a light plane will range from no rental, for the farmer who keeps his ship in an outhouse, to moderate expense for those utilizing one-half of a two-car garage or space in a hangar at the field. In the cost tabulation which follows an average present rental of $20 per month is assumed, but this will be speedily cut, at least in half, by wide awake manufacturers.

Ground anchorage clips too should not be overlooked by designers, for light planes will be moored out on occasion and, unless staked down, serious wind damage may result due to the combination of light weight and large wing area.

Insurance is the principal item which may confidently be expected to increase considerably and this probability is another incentive for manufacturers to reduce all other costs to the minimum. As with housing cost, insurance may start at a zero figure with the farmer who refuses to worry concerning the possibilities of fire, theft, wind damage, flight hazard, property damage and personal liability, and increase to a fat figure with the man who insists upon complete coverage. Here again we find it rather difficult to strike an average, and for that reason a small random allowance is included in the estimate. Suitable flight characteristics and housing conditions will hold down all insurance costs except those of property damage and personal liability, which may soon be required by law.

Reductions in operating costs are matters of decreased fuel and oil consumption and, particularly, the use of the cheaper automobile grades of both. A reasonably safe assumption for fuel is three gallons per hour at 28 cents now and 20 cents later. Lubricating oil, although a much smaller item, nevertheless is worthy of consideration. A reduction of 30 per cent in fuel and oil costs will do much to encourage private flying, not only through increased economy, but also as an inducement to the more enterprising cross-roads gas stations to grade and mark an adjoining lot as a service field for the use of light plane pilots.

Because of its inherent advantages of safety, simplicity and low fuel cost, the ultimate supremacy of the Diesel engine appears ensured, yet it is hardly a matter to be reckoned with in light planes during the next few years. Costs of maintenance and parts replacement are deserving of thorough study because of the fact that durability will be difficult to obtain with very light, small-membered structures. Amply strong for their purpose in flight these members will be, nevertheless, highly susceptible to the influence of deterioration and of careless handling. The solution to this problem appears one of machine made parts, easily assembled.

Engine replacement must be entirely done away with. Wearing qualities must be increased until engines are capable of outlasting the ships they power. An engine life

(*Continued on following page*)

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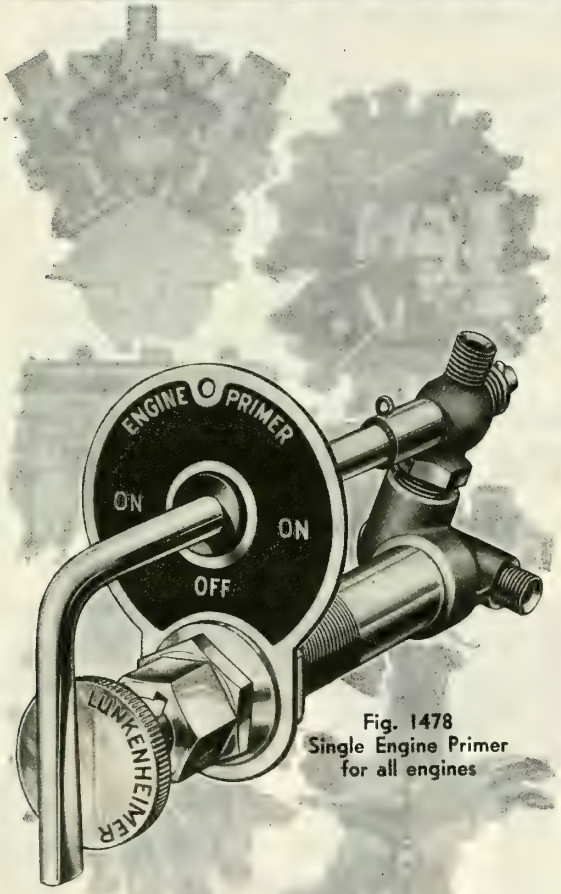


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(*Continued from preceding page*)

of 3,000 hours is not only desirable but necessary for light plane purposes.

Cloth covering appears destined to survive for many years, at least until more efficient methods are devised for utilizing aluminum alloy sheet. Structures should be designed to accommodate ready-made slip-on covers to be stocked by dealers, since re-covering will generally be done by the owner, or by a nearby service station. The durability of cloth covering is dependent upon texture and finish as well as exposure to weather, but a life of 20 months per cover appears reasonable. It is important in this connection that cloth manufacturers get busy and produce a cheaper, lighter and otherwise more suitable covering for light planes, to replace the standard product now being used which is adapted to much heavier wing loadings.

The following light plane cost estimate is based upon a plane life of five years, assuming 240 hours of flying per year, a total of 1,200 hours. Costs per mile were not tabulated because unimportant in pleasure flying. However, if a design cruising air speed of 60 miles per hour is assumed, the effective or ground speed will not average much over 50, which works out to a total of 60,000 miles. From this figure approximate costs per mile may readily be obtained.

COST ANALYSIS FOR LIGHT PLANE OWNERS

	Total Cost	Cost per Hr.
First Cost		
Plane, including flight instruction.....	$1,400	$1.167
Fixed Overhead		
Housing (@ $20 per mo.).....	1,200	1.000
Insurance (@ 5% per annum).....	350	.292
Operating		
Fuel, 3 gals. per hour (@ $0.28 per gal.)	1,008	.840
Oil, 1 pt. per hour (@ $0.35 per qt.)...	210	.175
Unforseen contingencies (@ $30 per yr.)	150	.125
Maintenance		
Parts replacement (@ $40 per year)....	200	.167
Re-covering, 2 times (@ $75).....	150	.125
Totals	$4,668	$3.891

From the above tabulation, it is evident that the average monthly cost for approximately twenty hours of flying will be around $80, which is a good-sized pleasure bill for a wage earner to be expected to pay cheerfully. The actual number of hours that a machine will be used will depend of course upon a number of variables, such as the owner's interest in the art, occupation, nearness to field and the weather conditions in that locality. However, it is doubtful whether an average of twenty hours per month will soon be exceeded. From this we deduce that the individually-owned light plane will depreciate more as a result of idleness than of service wear.

Light planes today probably are good for twice the total hours stated, assuming a replacement engine, and wearing abilities certainly will be increased rather than decreased. Thus the balancing of usage with cost emphasizes not only the importance of drastic cost reductions, but also that the very best field for light plane prospects is at present among groups or clubs. It is evident that group ownership will increase the total costs of fuel and oil, insurance, maintenance and probably flight instruction, but the final cost per hour to the individual member will be materially reduced and the plane more fully utilized.

Pleasing appearances will do much to attract light plane prospects—smooth lines, snappy color scheme, good materials and clever workmanship. Comfort and convenience, simplicity and safe performance are important requisites. But cost, nevertheless, will be the dominating factor in the sale. For after all, 'tis the things that men can afford—not those they would prefer to have—that keep the wheels of industry turning.

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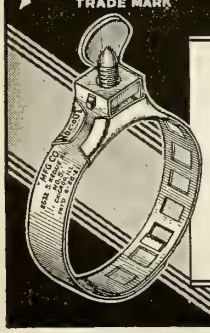
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INVESTIGATION OF THE BURNELLI

(*Continued from page* 53)

single-engined plane is based primarily on the absence of the nacelles, the smaller frontal resistance area and the lower weight for engine installation—the same factors which favor the wide fuselage too. There remain only two arguments for the single-engine arrangement, the lower unit weight of one stronger engine as compared to that of two lighter ones, and the higher ratio of power per frontal area. A survey of available commercial engines, however, shows that the unit weight does not decrease materially above 600 horsepower and this is the range where Burnelli planes are best adapted. It is only the weight of the engine controls and pipe line system that would favor the concentration of power. The important consideration of horsepower per square foot frontal area is dealt with in Figure 3. As outlined before, the conditions as to this point are the more favorable with larger planes, because the frontal area of the body does not increase proportionally with the power and because an increasing area can be deducted due to the lift effect. In Figure 3, for comparison, the values for the Lockheed Vega, which represents the ultimate limit as to reduction of the frontal area of the fuselage, and the values for a 640-horsepower and 1200-horsepower passenger plane of orthodox design are indicated by horizontal lines. The intersections point out the degree to which the Burnelli plane must be increased in size in order to meet the corresponding frontal area conditions.

It is not structural and aerodynamic efficiency alone, however, which decides for or against either one type; it is safety which created the demand for larger planes and led to the distribution of the powerplant despite the sacrifices of performance and despite the tedious work connected with the maintenance of and care for three engines and three pipe line systems. From this viewpoint the Burnelli design appears to combine the advantages of both types. It compares in aerodynamic efficiency and simplicity with the single-engined plane and combines the size increase possibilities and multiple-engine features of the nacelle type.

WHY THEY JUMP

(*Continued from page* 45)

out them. Most of these cases were the result of the loosening or breaking of the safety belt at the top of inside loops, or during outside loops, or in other unusual maneuvers. A few were tossed out unexpectedly in rather humorous circumstances. One stooped to pick up a map, whereupon his little pursuit ship went into a nose dive. Another went to sleep with his head on the cowling. The ship lurched in a bump and this passenger woke up in the air, his pilot not missing him for several miles.

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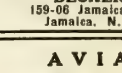
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SERIOUS YOUNG MAN; 22, high school graduate; 3 years evening college, experienced bookkeeper and junior public accountant; clean record; desires opportunity with an aviation company, preferably in or near Chicago, in its office, field or factory. AERO DIGEST, Box 1088.

TRANSPORT PILOT desires position with reliable concern or individual. Classes 1A and 1C, and mechanic's license. Experienced in instruction, cross country and night flying. Age 25, married, best references. Available immediately. C. E. Callahan, 801 W. Oklahoma Street, Enid, Okla.

TRANSPORT PILOT No. 8115, open and cabin planes. Mostly private operation. Best references. A. R. Jackson, Brainerd, Minnesota.

TRANSPORT PILOT, 800 hours, cross-country and instruction. Age 24. Will go anywhere. Best references. At liberty after February first. Box 173, Viborg, S. Dak.

TRANSPORT PILOT: Desires position, tri-motor or single motor cabin; over 2500 certified hours. Past two years mail and passenger line flying. Age 33, married, very best references. AERO DIGEST, Box 1076.

TWENTY YEARS experience machine shop, tool and die work. Graduate Aviation Institute U. S. A. Desire connection in aviation where previous experience will be asset to employer. P. Sangoff, R.F.D. No. 1, Blanchard, Michigan.

GIRL PILOT, student Marshall Flying School, approximately 35 hours solo. Have Private Pilot's license. Willing to work for living expenses if proposition has future, in order to build flying time. Will go anywhere. Barbara S. Poole, care Marshall Flying School, Marshall, Missouri.

YOUNG AUTO MECHANIC, 20, wishes to get into aviation industry. Will work three years for commercial license. Fast at learning; willing to work. Best references; surrounding states preferred. Fred Copelle, 282 Myrtle Ave., Elmhurst, Illinois.

POSITION WANTED: Licensed A. and E. Mechanic. Field and factory experience on land and seaplanes. Some flying time. Will go anywhere. Good references. Art Carlson, Webster, S. Dak.

YOUNG MAN, 22, wishes connection with some airport or factory. Wants chance for advancement. No drifter; little experience. Can go anywhere. AERO DIGEST, Box 1083.

YOUNG MAN; 26, college education, desires any aviation connection; free to travel. Some engine experience at Curtiss. Able to invest small amount if opportunity arises. AERO DIGEST, Box 1086.

YOUNG MAN, 20, high school education, desires position in aviation. Willing to work for living expenses and flight instruction. Can go anywhere. Best references. R. L. Matthews, 852 E. College St., Shreveport, La.

YOUNG MAN, 23, High School graduate. Wishes to get connection with some company where he can learn aviation. Mechanical or business position. Good mathematician. Linden J. Crane, RFD No. 3, Mason, Michigan.

ATTENTION NAVAL AIRCRAFT manufacturers: Anodic expert offers his services. Will supervise operation of installation of anodizing equipment. Will go anywhere. Good references. AERO DIGEST, Box 1085.

COMPETENT AERONAUTICAL ENGINEER: Graduate of University of Michigan. Two years experience in stress analysis and structural design. AERO DIGEST, Box 1087.

HARVARD BUSINESS SCHOOL student, Stanford graduate, naval aviator, transport pilot with 250 hours Navy time, desires connection in commercial aviation after June 15, pilot or office work, preferably in transport aviation or business side of commercial aviation. Age 25, unmarried. Will go anywhere. AERO DIGEST, Box 1074.

AIRPORT MANAGER and transport pilot, both army and civilian experience. Over 650 hours student instruction and cross country. A and E Mechanics license. College graduate. Age 35, married. References. AERO DIGEST, Box 1103.

TRANSPORT PILOT: A & E mechanic license, survivor of barnstorming days in Southwest and East, 11 years experience. Army mechanic during and one year after war. Over 2500 hours on all types single engine ships, 1 and 2C ratings, land and seaplanes, open and cabin, no accidents of any kind. Experienced as instructor. Motor and plane experimental pilot. Will accept long term or temporary work with private owner, factory, school or flying club. Rather be my own mechanic. 31, married. AERO DIGEST, Box 1089.

A & E LICENSE, 12 years with engines, 7 on aviation engines. Experienced in design, building, maintenance, repair, test; factory and field; 2 and 4 cycle, gas and oil fueled, Curtiss-Wright factory. Desire to enter engineering field; location secondary to opportunity. Age 30. Carl F. Meyer, 947 Cornelia St., Chicago, Illinois.

POSITION WANTED as airport manager and mechanic. Aviation school graduate, some airplane engine work; A1 automobile mechanic. Married, 23. Wife capable of taking care of office work. Prefer position in or near Wisconsin. A. E. Freiheit, Markesan, Wisconsin.

TRANSPORT PILOT: 2 years experience including barnstorming, airport management, student instruction, open and closed types. Curtiss graduate. Excellent references. J. B. Meyser, 1522 - 21 Ave., Rock Island, Illinois.

LICENSED TRANSPORT PILOT desires a flying connection. Will accept any proposition. Over 300 hours, open and closed ratings, cross country, night flying and instruction. No crack ups. Splendid references. AERO DIGEST, Box 1090.

GRADUATE PARKS Mechanic School, grade A recommendation, also high school. Desire connection with airport or factory in eastern U. S. Good character; references. Age 18. AERO DIGEST, Box 1092.

WANT—OXX6 new or slightly used. AERO DIGEST, Box 1101.

TEMPLE UNIVERSITY GRADUATE: BSC., transport pilot, Naval aviator, single, 23. After July 1st desires office or flying position with transport, mail, or oil company. Proficient in radio, accounting, office management and flying. AERO DIGEST, Box 1093.

TRANSPORT PILOT: well educated, age 25, wants position flying for individual or concern where there is opportunity to work in with party in other capacity as well as pilot. Over 2200 certified hours, no accidents. Tri-motored and small ship ratings; A1 references. Very small salary considered if opportunity for advancement. AERO DIGEST, Box 1091.

L. C. PILOT, single, 23. School graduate. 85 hours solo on open and closed type. Desires position. Can furnish good references. Will go anywhere. AERO DIGEST, Box 1095.

YOUNG MAN, 21, Curtiss-Wright mechanics school graduate with about two years experience, desires job with reliable firm. Will go anywhere Russell Kirby, Wabash, Indiana.

TRANSPORT PILOT: Open and cabin ship ratings, desires position with school or individual as flight instructor. Knows aerial navigation and meteorology. Good engine and airplane mechanic. Barnstorming and night flying experience. Excellent record. Working knowledge of Spanish, can read and speak Portuguese. Will consider South America. Transport, Box 92, Sheridan, California.

TRANSPORT PILOT: 2500 hours; 10 years experience; 34 years old. Classified any type of plane except Trimotor. Experienced instructor, passenger liner, air mail. Old time barnstormer. Go anywhere. Best references. Post office Box 58, Decherd, Tennessee.

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TRANSPORT PILOT: 637 hours, student instruction, barnstorming, cross country. A1 rating. Age 22; high school graduate. Wages secondary, just to tide over this bad year. Will go anywhere. Best references for character and flying ability. Harold Clobes, Box 162, Fairfax, Minnesota.

YOUNG MAN, 20, wishes connection with airport. Has had training on rigging; also trained with U. S. Government approved school. Wants chance for advancement; no drifter. Can go anywhere. N. T. DeFeo, 841 Dayton Ave., St. Paul, Minnesota.

GRADUATE Von Hoffmann Aircraft School, 1A rating. Age 32. Desire to build up required hours for Transport license. Will work for small salary. Excellent references. AERO DIGEST, Box 1069.

YOUNG MAN, 23, desires position on airport. Aviation school graduate. Have soloed. Willing to work for living expenses to start with providing proposition has future. Will go anywhere. E. M. Sivesind, Waukon, Iowa. R No. 5.

YOUNG MAN, 27, single, Liberal Arts Degree, 6 years business experience including present position; 3 years manager of department store doing $300,000 volume. Studied aviation 2 years. Will have LC license July 1. Interested in making connection with the industry in transport, sales and advertising, or manufacturing field. Will be available July 15th. AERO DIGEST, Box 1096.

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YOUNG MAN with two years design and some construction experience needs work badly. Best references; can go anywhere and do anything. Have dependent. AERO DIGEST, Box 1097.

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POSITION WANTED: Transport pilot, 1A rating, cross country, instruction, management, mechanic. A1 references as to character, flying ability, etc. Emmett Kyle, Bristow, Iowa.

TRANSPORT PILOT desires position. Open and closed planes, cross country and night flying experience. AERO DIGEST, Box 1100.

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400 car Garage
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Washington, D. C.
Exceptional location. Rates reasonable, consistent with good service.
WALTER FLETCHER SMITH, Proprietor

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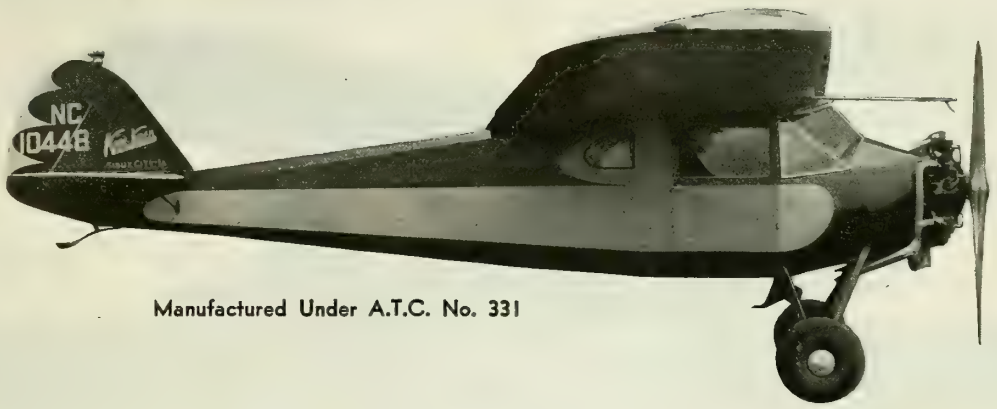
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THE KARI-KEEN "90"



Manufactured Under A.T.C. No. 331

THE KARI-KEEN "90" is generally accepted as the most practical cabin monoplane designed for the school and private owner. Every desirable feature known to modern aircraft will be found in the KARI-KEEN without a single sacrifice of safety. Abundance of cabin room — the seat is as wide as the one in your car. Open ship visibility. Take-off and landing performance that will please the most critical pilot.

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Write or wire for further particulars. Some territories available for 1931 to responsible operators.

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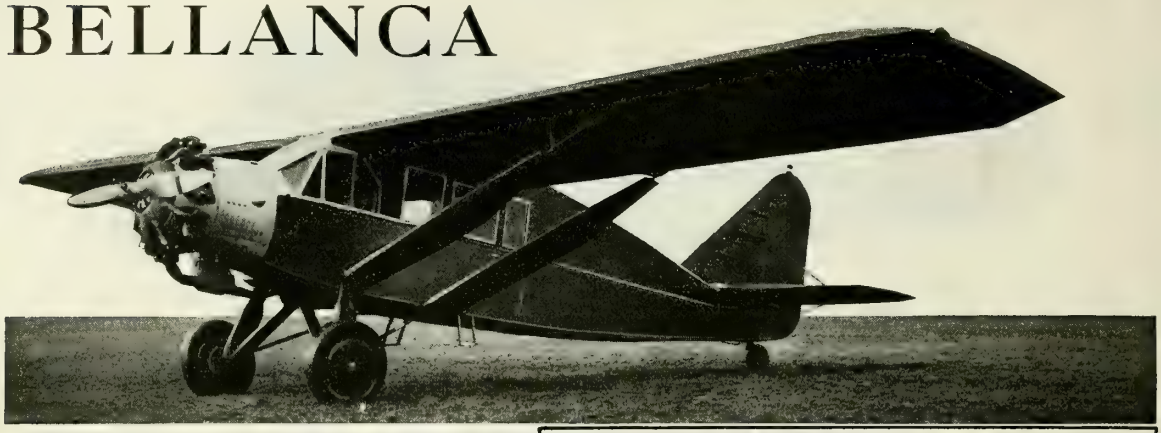
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"YOUR lacquers and dopes stand up in every variety of climate from the extreme cold of the far Canadian north to the burning tropical heat of Central America," writes G. M. Bellanca, president of the Bellanca Aircraft Corporation. This letter is typical. Berryloid Aircraft Finishes are made to last under all conditions. That's why these protective products are first choice of the aviation industry. Each finish in the line was developed in close cooperation with leading military and commercial aircraft authorities. Be sure to get the utmost in beauty and durability for your ships. Insist on Berryloid.

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December 4, 1930

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c/o Berry Bros., Inc.
Detroit, Michigan

Dear Mr. Colby:

For some years now we have been finishing Bellanca airplanes with Berry Brothers' products. Our ships so finished have operated in many countries and in every variety of climate from the extreme cold of the far Canadian North to the burning tropical heat of Central America. Your dopes and lacquers appear to stand up very well under the most difficult conditions and it gives us pleasure to express herein our genuine satisfaction.

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Gm Bellanca
President

BERRY BROTHERS INC.
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DETROIT, MICHIGAN • WALKERVILLE, ONTARIO
MANUFACTURER OF PROGRESSIVE AIRCRAFT FINISHES
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And *now* . . .

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PAA *Pan American Airways*, with a vast network of airlines over South and Central America . . . *Cia. Mexicana de Aviacion, S. A.*— air-mail and passenger service between Brownsville and Mexico City—

Curtiss-Wright Flying Service — with flying fields, schools and maintenance depots from coast to coast—

Boeing Air Transport, operating the long Chicago-San Francisco run. And now—

NAT *National Air Transport*, carrying air-mail and express from New York to Texas — operating passenger service between Cleveland, Detroit, Chicago.

THESE five great companies have chosen Mobilgrease for rocker-arm lubrication. All decided on Mobilgrease only after careful tests.

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FOR ROCKER-ARM LUBRICATION USE MOBILGREASE

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AIRWAY CORPORATION

PAUL F. COLLINS
VICE-PRESIDENT IN CHARGE OF OPERATIONS

WASHINGTON BUILDING
WASHINGTON, D. C.

December 4, 1930.

Eclipse Aviation Corporation,
East Orange,
New Jersey.

Gentlemen:

We are using your starters on the Lycoming motors in our new high speed trimotored Stinson planes. Our operation necessitates [illegible] two hundred [illegible] one short delay in approximately one million motor miles due to starter trouble.

We also feel that these starters have in a large measure contributed to the punctuality of our plane movements.

Very truly yours,
Paul F. Collins.

pfc.jp

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More than 200 starts per day —no trouble

ELEVEN hourly round trips per day; nine starter operations for each start — once to warm up, again after loading passengers; more than 200 "starts" each day: that is the service demanded of Eclipse Aviation Starters by New York, Philadelphia and Washington Airway Corporation, operating tri-motored Stinson planes, Lycoming powered.

It's extraordinary service, to be sure; but it's an extraordinary starter — a reasonable explanation for its universal popularity among builders of aircraft engines.

ECLIPSE AVIATION CORPORATION
EAST ORANGE · NEW JERSEY
(DIVISION OF BENDIX AVIATION CORPORATION)

APRIL, 1931 · · 35 CENTS

AERO DIGEST



THE NATIONAL AIRCRAFT SHOW

·

DETROIT

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Top—Hornet-powered Consolidated Commodore used on Pan American's route across the Caribbean. U. S. Transport map—black lines indicate important, regularly scheduled air lines using Pratt & Whitney engines

PAN AMERICAN FLIES THE WORLD'S LONGEST OVER-WATER HOP WITH PRATT & WHITNEY ENGINES

Of the 1,385 air miles between Miami and Cristobal, 1,335 are over water. Between thirteen and fourteen hours of flying—and the planes of Pan American Airways make it regularly, carrying passengers and mail.

Here, on the world's longest regularly scheduled over-water route, engine reliability is of supreme importance. And the Pratt & Whitney "Hornets" used by Pan American are delivering steady, unfailing performance. So too, on approximately ninety per cent of the other regularly scheduled air transport lines of this country "Wasp" and "Hornet" engines are making air power dependability a matter of certainty.

★ *Pratt & Whitney engines will be on exhibit at booths 124-134, Detroit Aircraft Show.*

THE
PRATT & WHITNEY AIRCRAFT CO.
EAST HARTFORD . . . CONNECTICUT
Division of United Aircraft & Transport Corporation

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, Quebec; in Continental Europe by Bavarian Motor Works, Munich; in Japan by Nakajima Aircraft Works, Tokyo.

Wasp* & Hornet* *Engines*
* REGISTERED TRADE MARK

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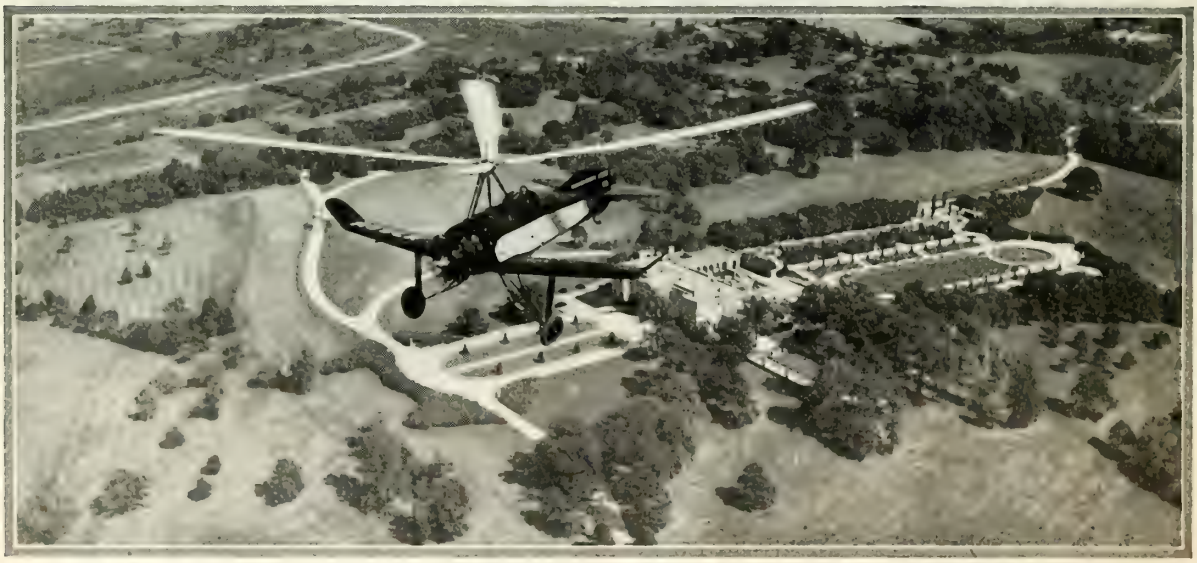
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DETROIT
MICH

Sales Office:
114 Sansome St.
San Francisco

*ONE OF A SERIES OF ADVERTISEMENTS BASED ON STATEMENTS



Low, high, fast or slow — —situations which might be critical for the conventional airplane give the Autogiro pilot no concern.



Above: In tune with the pilot's mood, the Autogiro speeds from point to point or wanders lazily along, always able to land in any small, open space.

Below: The Autogiro principle is adaptable to many variations of type, model, power and size.



AUTOGIRO COMPANY OF AMERICA

BY RECOGNIZED AVIATION AUTHORITIES—NAMES ON REQUEST

"Make it less necessary for the pilot to do the right thing" *

IT has been estimated that security in the conventional airplane of today is 90 percent dependent upon piloting skill. ". . . *personal safety is governed, in the Autogiro, in ratio of about 10 percent piloting skill and 90 percent inherent aerodynamic stability.*" *

The layman has come to believe that learning to pilot an airplane is a long and tedious process . . . "*After a very little dual instruction, and that of the most elementary nature, a student can be allowed to learn the finer points of maneuvering the Autogiro by himself.*" *

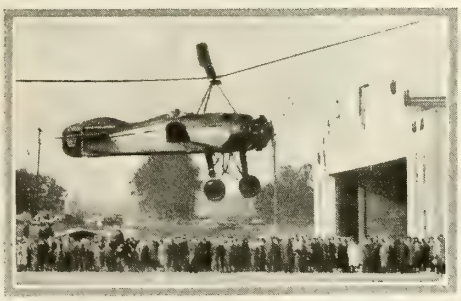
Relatively few persons have the natural aptitude necessary to become competent pilots of the conventional airplane. ". . . *a novice . . . in the case of an Autogiro . . . is placed in much the same position as when learning to drive a motor car.*" *

Widespread development of the potentially great private market for aircraft can come only when the private pilot of moderate ability can fly with the same confidence and sense of security with which he drives his car . . . "*The safety of the rotating-wing craft is about as high as can be hoped for in any field of mechanical transport.*" *

The Autogiro Company of America is not a manufacturing or selling company. It is solely an engineering and licensing organization. It owns and controls, exclusively, all Autogiro patent rights in the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full co-operation of our engineering staff. We are now prepared to arrange demonstrations to acquaint the industry with Autogiro principle, design and operation, and to discuss production privileges.

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The Autogiro differs basically from all other heavier-than-air craft in the source of its lifting capacity. This lift is given primarily by four rotating blades which take the place of the familiar wings of an airplane. There is no time when this supporting rotation of the blades can be stopped while the machine is in the air, as their motion is produced solely by wind pressure caused by the movement of the Autogiro in any direction, climbing, level flight, gliding or descending vertically. The supporting rotation of the blades is entirely independent of the engine, whose sole function is to propel the Autogiro.



At Curtiss-Wright Airport, Baltimore. Interest in the Autogiro grows apace.

The Autogiro presents flying characteristics hitherto impossible. It can take off at low speed after a very short run, and immediately assume a steep-climbing angle. It can fly well over 100 miles per hour, or as slowly as 25 miles per hour. It can be brought momentarily to a standstill and hover. It can bank and turn slowly without fear of loss of forward speed. It can glide or descend vertically at a speed less than that of a man descending in a parachute, and with virtually no forward speed even with a dead engine. Above all, it cannot fall off into a spin from a stall. As a result, little operating skill is required.

AUTOGIRO

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LAND TITLE BUILDING, PHILADELPHIA

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Waco selects the Continental A70 second series engine for 1931 models

In the new *Waco F-2* three-place open plane, and in the new *Waco C* four-place cabin biplane, the Continental A70 is specified as standard power equipment. • Waco's selection of the Continental engine was made after exhaustive tests over a period of six months, which supported conclusively its already established reputation for smoothness, dependability and stamina.

The Second Series Continental 7-cylinder Radial Engine is conservatively rated at 165 h. p. Navy Test Rating 177 h. p.



The extremely low operating and maintenance costs are additional reasons for the choice of Continental Engines.

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Continental
for the Airways of America

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A CABIN WACO

as a companion to the popular model 'F'





These are the requirements originally laid down to WACO engineers for the development of a cabin WACO ● ● **(1)** To design a 4-place cabin ship with performance characteristics typical of WACO open-cockpit ships, particularly as to ability to get into and out of small fields ● ● **(2)** To retain the economies in weight and size inherent in biplane construction, but to provide wider angles of vision than any biplane has ever before permitted ● ● **(3)** to keep the price below $6000, but to sacrifice no practical refinements, and to give a measure of value beyond comparison ● ● ● Large order that, but nothing less would justify an attempt to earn the same dominance in the field of cabin airplanes that WACO has so long enjoyed among open-cockpit ships ● ● ● After many months of development these specifications have been not merely satisfied but exceeded. The measure of accomplishment we confidently leave to your judgment. Complete details at your request. Ask also about the brilliant new WACO "Model F2" with Continental 165 h. p. engine.

● **Open-model PERFORMANCE in an enclosed ship** ● **Monoplane VISIBILITY in a biplane design** ● **and VALUE that challenges comparison**

THE WACO AIRCRAFT COMPANY, TROY, OHIO

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FOR THE OWNER-PILOT

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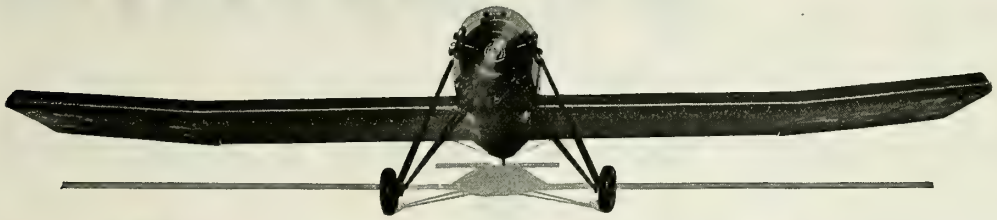


PARK IT IN THE BARN!

This folding wing—the ample ground clearance and the simple-efficient Szekely 45 HP motor are just a few of the several features which make the new NB-Trainer at **$1490** the most advanced and desirable plane of 1931—Fly it at the Detroit Show or write Nicholas-Beazley Airplane Company Incorporated Marshall Missouri

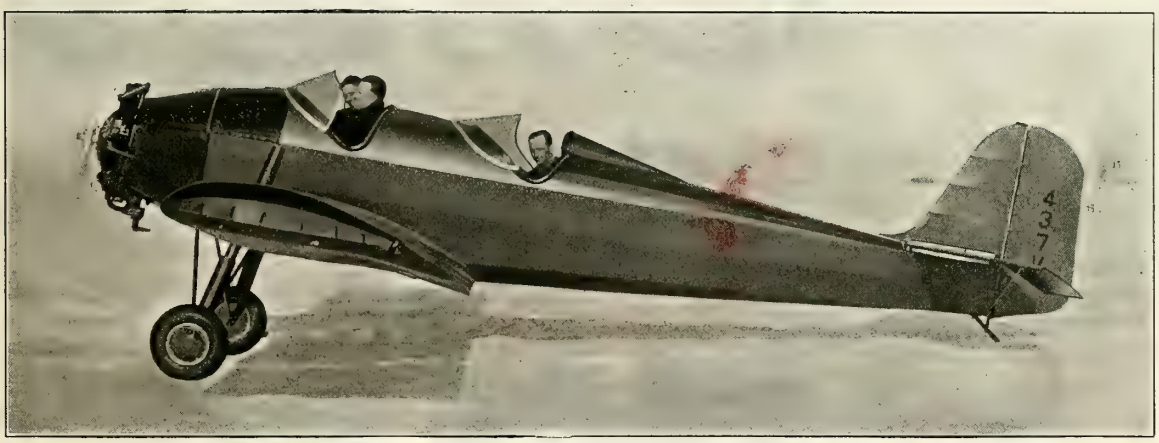
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THE NEW NB-4!



FOR THE OPERATOR

A more efficient - dependable unit for economical operation—all metal structured - full cantilever wing - perfected fairing - combining strength and speed—no rigging for life - more pay load per horsepower - lowest insurance rates - less unproductive operating costs - assure you profits—

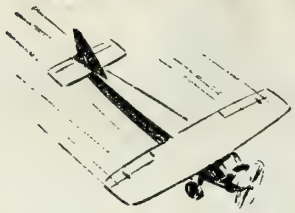


Perfect visibility—comfortable - draftfree - upholstered cockpits—high maneuverability - smart - superior performance—designed for rugged service and accessibility—powered by Warner or Lambert 90's—with hydraulic-stream-lined landing gear - brakes and air wheels—a wise buy at **$3900**—fly it at the Detroit show or write

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NICHOLAS-BEAZLEY

IN 48 STATES



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By the use of the facilities of the Standard Oil Company of California, Standard Oil Company (Indiana), and the Standard Oil Company of New Jersey, constant and exacting supervision is maintained by the Stanavo Specification Board over the manufacture and distribution of Stanavo products.



Actual Flying Tests



Cooperation with Government Services

» *Visit the Stanavo Exhibit at the National Aircraft Show.*

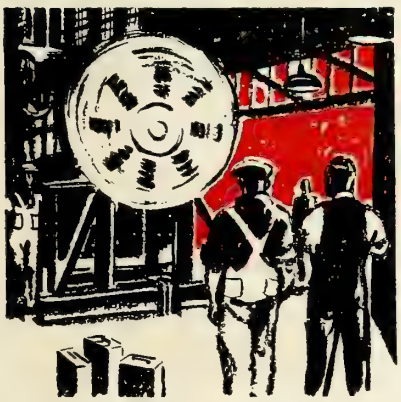
Stanavo aviation products

California Standard Oil Co. De Mexico
Colonial Beacon Oil Company, Inc.
Humble Oil and Refining Company
Imperial Oil, Ltd.
International Petroleum Company
Midwest Petroleum Sales Inc.
Pasotex Petroleum Company
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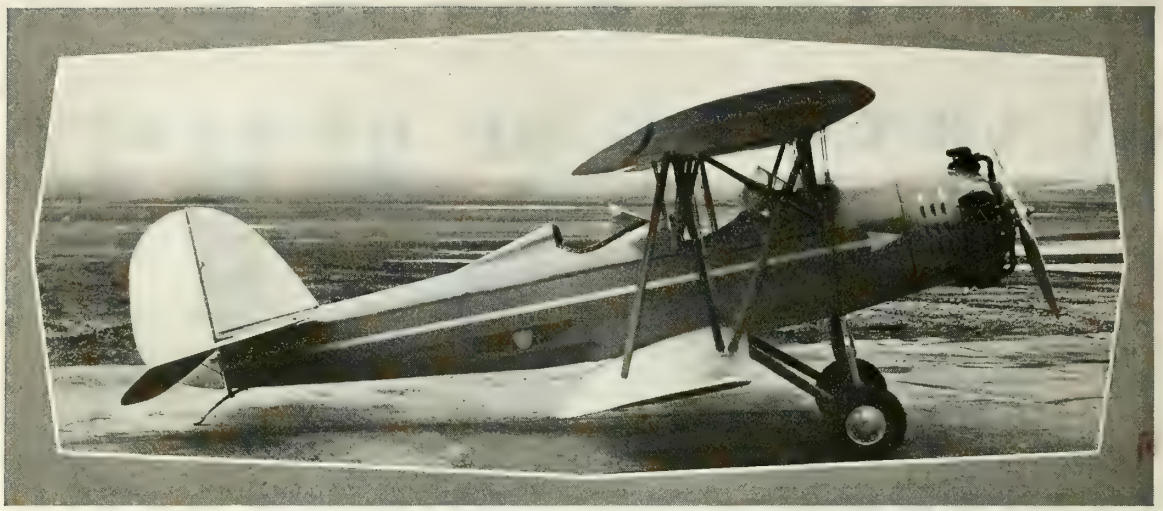
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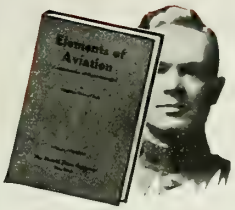
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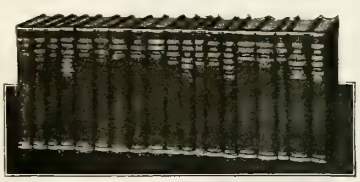
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Gliders and Gliding

by Lieut. Ralph S. Barnaby, Bureau of Aeronautics, U. S. Navy; First American First-Class Glider Pilot. 123 *illustrations,* $3.00

A practical handbook for glider flyers and builders, by an expert on gliders. Gives a detailed, progressive course in flight training with full information about types of gliders, required ground and wind conditions, launching, first flights, maneuvering the glider, and landing. Starts with the first short hops of primary instruction and progresses through secondary training to a full course in soaring. For those who want to build a glider, it gives the needed design principles and structural details, with useful data on materials, assembling, rigging and aligning.



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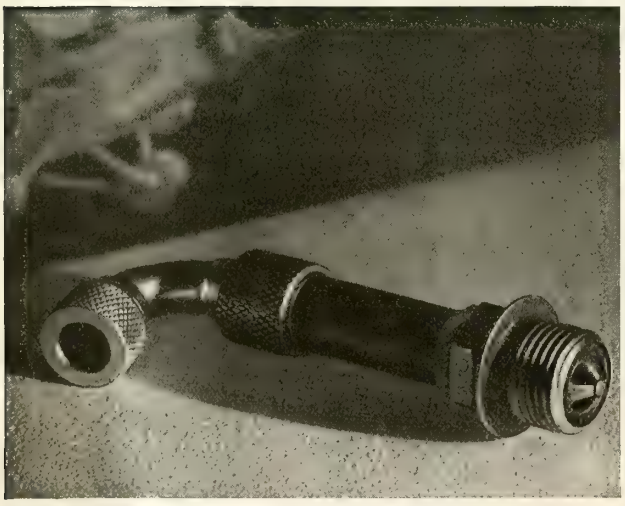
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Considered from the only standpoint that is really important, that of superior and uniform service, B. G. Mica Aviation Spark Plugs are *highest* in flying safety and *lowest* in service cost. They are made of the best materials throughout, insulated with selected mica which is the only insulating material that will withstand mechanical abuse and meet all the demands of modern aviation engines. They are wrought by specialists, every one of whom is a craftsman at his particular bench. Severe testing and meticulous inspection prove the high uniform quality of every plug. Unremitting efforts to improve an already *good* product—constant striving to make a *better* plug—have resulted in the unquestioned leadership of B.G. throughout the entire aviation industry.



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This new B. G. radio shielded spark plug—in conjunction with shielded magnetos and harness—eliminates all ignition interference, keeps out dirt, water and oil and gives positive contact. It is insulated with mica—the superior insulating material. It has standard shell and core hexes, is easily serviced with standard B. G. tools, and can be assembled to harness without solder. Terminal connections fit any make of shielded harness, and are interchangeable on all B.G. radio shielded plugs. The threaded elbow terminal prevents short-bend wear and tear on harness and provides quick accessibility. Made in types for supercharged and super-compressed engines to meet idling or full throttle conditions.

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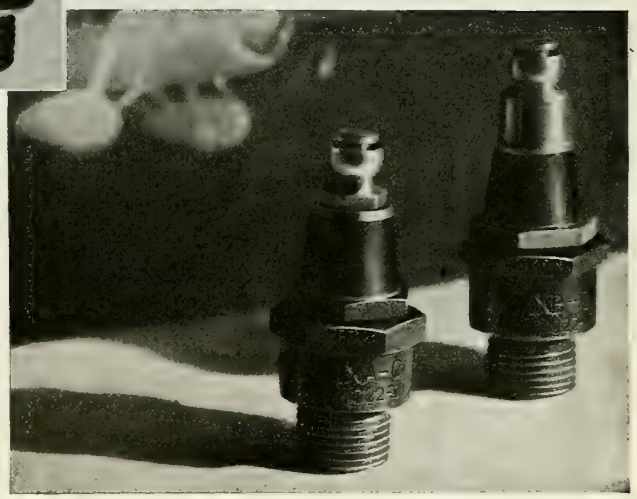
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There is a B. G. Hornet Spark Plug to fit every make of air-cooled and water-cooled engine. The latest plugs are the 3B-1; 4B-1; and 5B-1 models. These cover the entire range of operation from the highly super-charged engines to cold weather idling conditions in standard engines. The improved design and construction of each of these plugs gives increased electrode life and enlarges the range of operation.



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There are four different types of B. G. Spark Plugs with one inch hex. They are the 1XA Regular; 1XA Extra Gap; 1XB Regular; and 1XB Extra Gap. These plugs are used with unusual success in almost all standard types of engines. The Extra Gap models are the same as the Regular models except for the extra gap which is built into the terminals. The Extra Gap type is preferred by many users because there is greater resistance to fouling under certain excessive oil conditions.

The Choice of Those Who Know

B. G.'s are the best known spark plugs in aviation. For years they have been the choice of those who realize that safety in flying depends as much on perfected spark plug performance as on any other factor. For this reason, in 1930, as in many previous years, B. G. plugs were used in practically every outstanding aviation event. B. G.'s have stood the test, proved their worth and deserve their popularity. That's why they are used by such leading companies as American Airways; Boeing Air Transport; Colonial Air Transport; Eastern Air Transport, Inc.; National Air Transport; National Parks Airway; New York-Philadelphia and Washington Airway Corporation; Northwestern Airways; Pacific Air Transport, Inc.; Pan-American Airways; Pennsylvania Air Lines; Southern Air Transport; Transcontinental and Western Air, Inc.; Thompson Aeronautical Corporation; United States Airways; Universal Air Lines, Inc.; Varney Air Lines, and others.

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NEW YORK, N. Y.

CONTRACTORS TO THE UNITED STATES ARMY AND NAVY

THE NEW YORK SUN, WEDNESDAY, MARCH 18, 1931.

FLYING TAUGHT BY NEW SCHEME

Pupils Learn 'Feel' of Plane on Ground.

WILL SOLO ON FIRST HOP

North Beach Instructor Tries Modified Bleriot Plan.

Extracts from article by SHERMAN B. ALTICK.

* * * * *

The course is one in which the student learns to fly himself without dual instruction, the idea being to teach him by stages like a child learning to walk, first by sitting up, then by crawling and finally walking. In the case of flying it is by degrees, the student first learning the "feel" of the controls with a coordinator and a taxiplane or a clipped wing craft which the French call a penguin because it is just like any other plane but it cannot rise from the ground. * * * Lieut. George Rocgwell, originator of the improved Bleriot system, was in charge of Field 2 at Issoudun during the world war. He contends that students taught the "feel of the controls and automatic coordination before ever going into the air become far better pilots than those forced to assimilate the instruction while flying in a dual control machine. He also points out that it is much cheaper to teach flyers the principles of aviation on the ground than while soaring aloft in an airplane.

Four Pieces of Equipment.

Four different pieces of equipment are used in the modernized method of solo instruction. They are the penguin or "keewee" plane, the coordinator which really is a plane mounted on a universal with a fan to provide the slipstream for its ground operation, a glider and a plane of low horse power.

The first piece of apparatus to which the protential flyer is introduced is the coordinator. It is mounted on a framework and oscilates and rotates freely without lifting from the ground in the blast from the fan. It stimulates the movement of a moving airplane, and the student, by manipulating the controls, becomes quite familiar with the "feel" of them.

After the student becomes proficient in the operation of the coordinator he takes his first "hop" in the penguin or taxiplane. This is a plane in every sense of the word with the exception of the wings, which are so small that they do not provide ample surface to lift the craft from the ground.

The student pilots this clipped wing craft across the airport in straight lines to learn ground control and to become familiar with the operation of the controls in a moving craft. The first lessons are merely taxiing with the tail on the ground. But finally the student "flies" across the airport with the tail up in flying position.

This penguin as devised by Mr. Rockwell has bumpers fore and aft to prevent damage to the craft and injury to the student in case of a collision or a spill in a gust of wind.

Glider Used.

The third stage of training is glider manipulation, first in straight landings from a low altitude and next from higher levels. When the student has acquired the necessary skill in this stage of the training he is taught to make turns to the right and left, and then to make a long glide with a 360 degree turn and a landing at a given point.

The final stage of the training is to place the student in a low-powered plane and have him take off with an instructor who will act as a safety check on the pilot's ability. After three or four landings with the instructor as his passenger the fledgling is turned loose to make his first solo flight alone. The cost of the instruction is figured at an average of $7.50 an hour, and Mr. Rockwell expects most of his students to be able to qualify for a Department of Commerce license after thirty hours.

All the advanced training is to be taught in dual control planes in order to eliminate the chances of accident, Mr. Rockwell said today in outlining the plan of instruction.

FLIGHTLESS PLANE USED TO TRAIN AVIATORS



This craft teaches students the "feel" of the controls operated in the Solo System of Flying. While her clipped wings will not permit her to fly, the plane can be taxied.



GLIDER—HAPPY LANDINGS

LEARN TO FLY BY THE NEW SOLO SYSTEM
FOUR UNITS: TAXIPLANE, CO-ORDINATOR, GLIDER AND LIGHT AIRPLANE

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Not a mere amusement device, but a scientific system based on long-tried principles — a complete course leading to Private Pilot's License.

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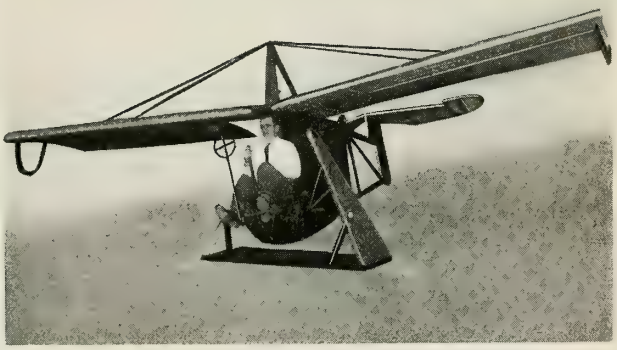
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Read in the magazines and newspapers about this great forward step in flying instruction. Watch for the pictures in your "Movie" Theatre.

See the units in operation at Glenn Curtiss Airport, North Beach, L. I. For reservations or particulars, call, write or phone Circle 7-4206.



LEARN AIRWORK IN THE COORDINATOR*
Teaches technique and handling of the controls

NEW YORK TIMES, SUNDAY, MARCH 15, 1931.

NEW TRAINING PLAN USES COORDINATOR AND TAXIPLANE TO GIVE "FEEL" OF AIR

(Extracts from Article)

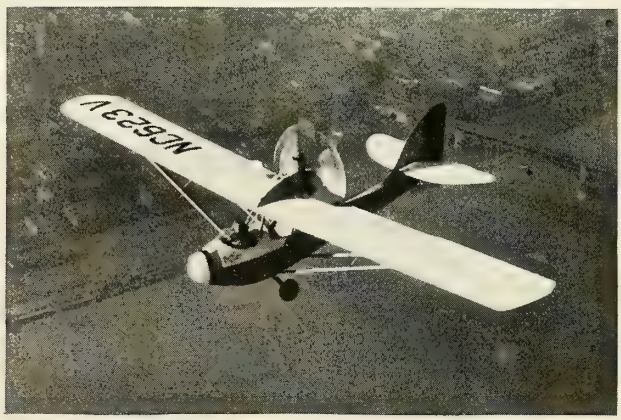
AFTER an extended period of study and preliminary tests a new system of flying instruction, known as the Solo System, will be tried out under the actual conditions to be found at an air field at Glenn Curtiss Airport, North Beach, this week. The backers of the system will open a school there. This method of instruction is based on the theory that as much as possible of the so-called "feel" of the air should be imparted to the student before he leaves the ground. * * * *

There are four things in which an amateur pilot must be proficient. He must be able to steer straight and keep the plane in a horizontal position parallel with the ground when he is taking off. He must learn coordination of his controls, the "quality" of their movement and how to operate them automatically, using hands and feet simultaneously until it becomes almost second nature to him. He must be able to know the "feel of the stall point," to know when he is approaching that point and how instantly to avoid it. In landing he must learn to level off his plane, glide to his landing and "set her down on three points."

"Going back to first principles," Lieutenant Rockwell said last week, "we sought to provide these essentials, enabling the student to learn the mechanical manipulations and primary elements on or near the ground before taking to the air. Some of the apparatus, we found, was available. Other devices had to be adapted or invented."

Four field units are used in the Solo System — "coordinator," "taxiplane," glider and a light airplane. The entire course, from the first lesson in the coordinator, is written in definite individual steps which are covered in practice. * * * *

Cost of instruction is estimated at $7.50 an hour average and it is hoped that the least adept student will be able to fly alone after thirty-eight hours.



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NSTRUCTION, 1780 Broadway, New York City

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FIRST IN SAFETY PROVISIONS

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AC Miko Spark Plugs are the only spark plugs with Isovolt electrodes welded to a center wire of special non-scaling metal. Likewise they are the first spark plugs to be cadmium-plated to prevent rusting of the shell.

And AC Miko quality is always uniform—every Miko spark plug is individually inspected—as dependable as modern science can make a spark plug. You run no chances with Mikos.



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VISUALIZE an airplane with the lines of a military pursuit ship—whose performance, in proportion to horsepower and size, is comparable to a pursuit ship's —whose inherent stability puts the fledgling pilot at ease in the air—whose certain response to every known maneuver reveals a new thrill to the seasoned pilot —and whose low cost and upkeep make flying for business, sport or training a logical sequence . . . picture all these in one plane and you have a description of the States Super Monoplane.

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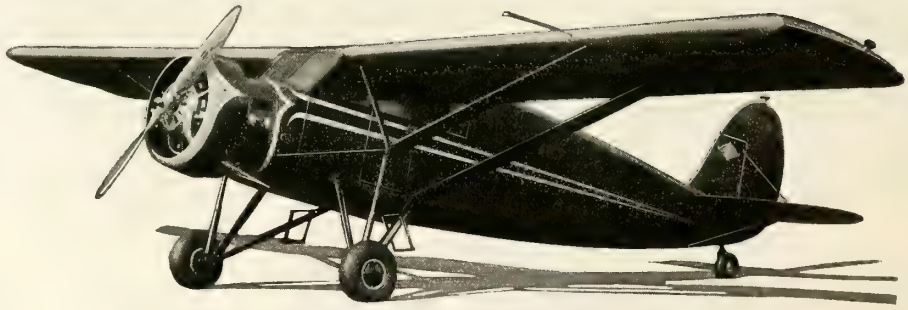
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Today Stinson is the standard of Aircraft value. Even competitors use the Stinson as a basis of comparison for their own planes. In scientific design, in rugged construction, in easy maneuverability, in efficient performance, in equipment, in comfort and refinements, and in durability, Stinson leads all others. Stinson standard equipment includes; electric starter, wheel and emergency parking brakes, shatterproof glass, dual wheel control, adjustable stabilizer, adjustable pilot seats, hydraulic and spring shock absorbers, flying instruments, navigation lights, balloon tire tail wheel, etc.

Leads In Sales

Of Cabin Planes. According to Cram's Aeronautical Report on airplane sales, in 1930 Stinson sold more planes than all other cabin manufacturers combined. While one of the manufacturers sold 37 more units, their best-selling plane was a 3-passenger open type of 100 H. P., priced at $4250. Compared with this, Stinson offers a plane that is 100% enclosed; 115% more H. P.; 33⅓% more passenger space; electric self-starter; adjustable metal propeller; and every possible luxury and convenience at little more cost.

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215 H. P. Lycoming Powered 4-Passenger Cabin Plane
Electric Starter Standard Equipment

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Stinson makes available for the first time in the history of aviation the benefits that are possible only when vast production resources, financial strength, experienced management and great buying power are concentrated on the building and marketing of better planes at new, radically low prices. Everyone profits from this program. The world applauds Stinson's success in making air transportation practical and safe and placing it within the reach of the thousands who have been waiting for it.

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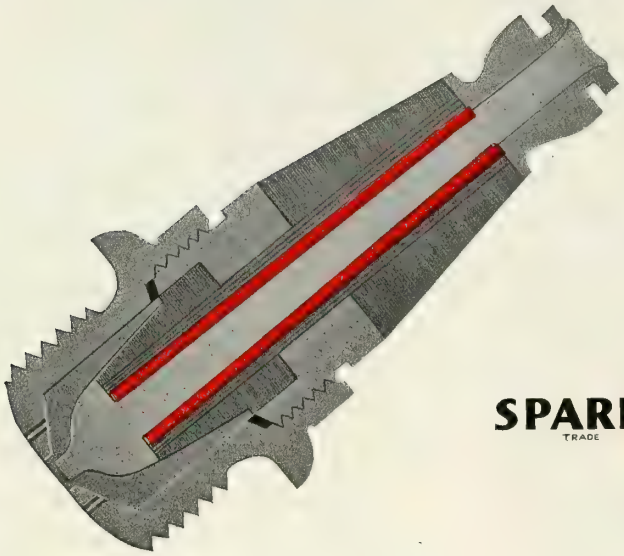
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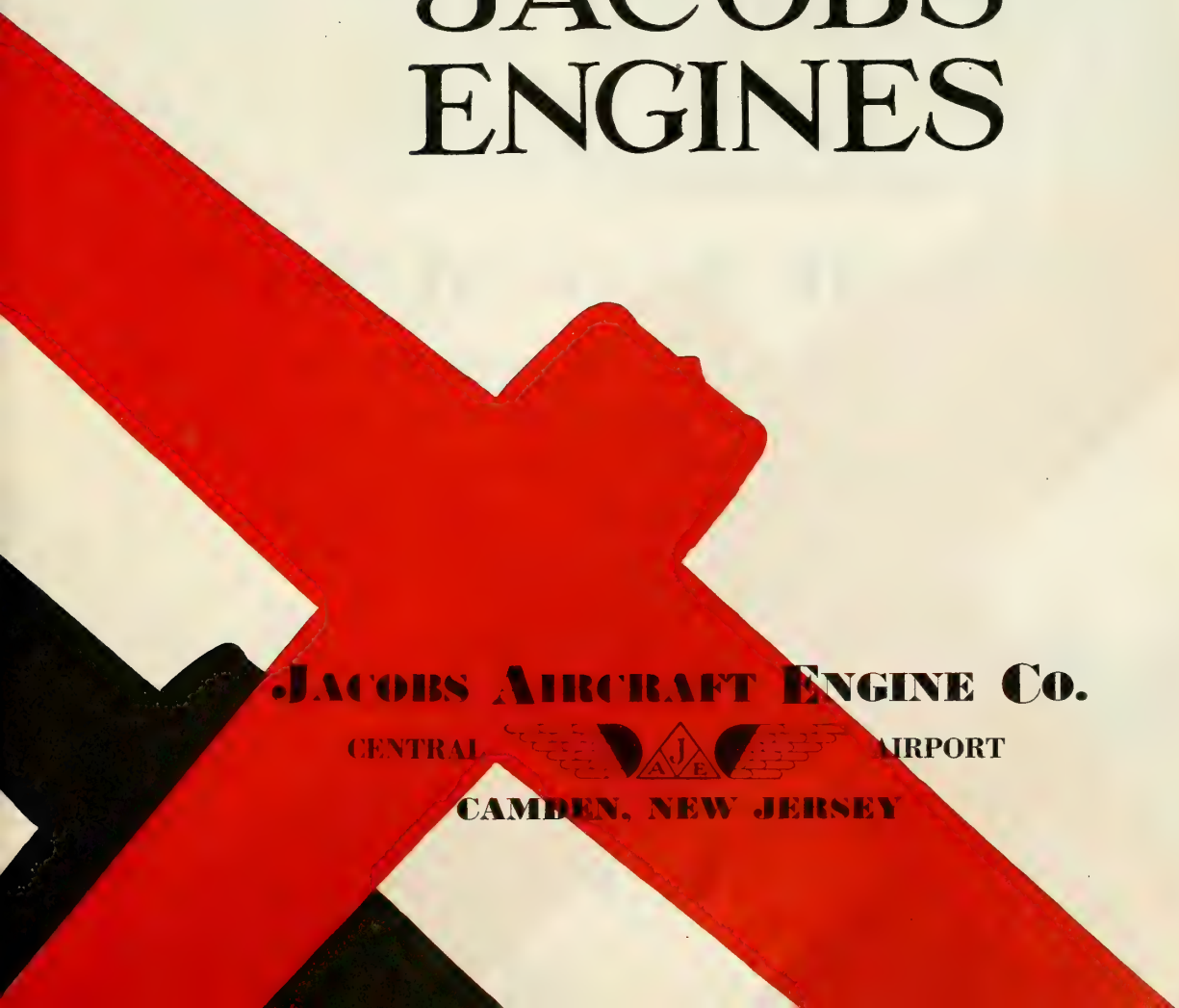
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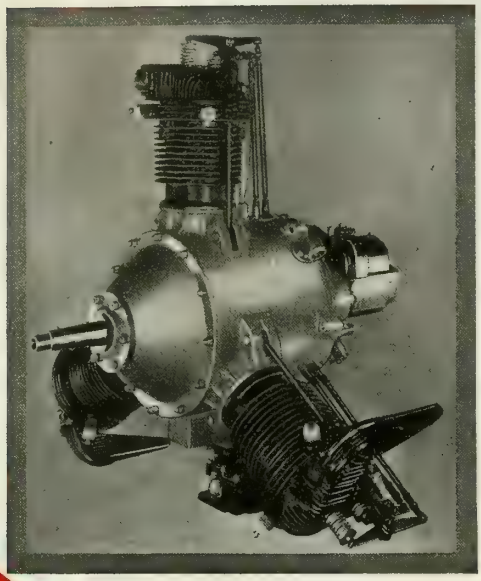
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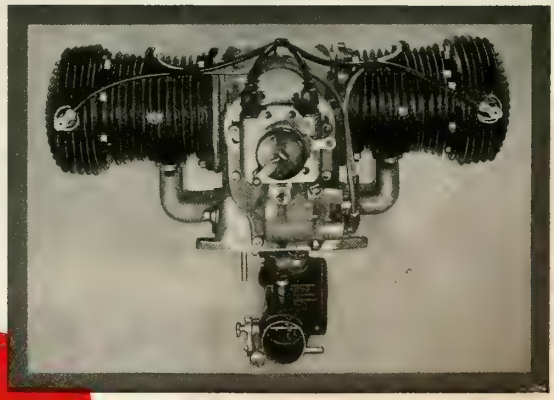
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41886-7	Y pipe water inlet assemblies	.75
0-14	Yoke tie down	.20
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41742	Connecting rod assembly	1.50
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Landing speed (m. p. h.).....	30	30	30	30
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(See also description on page 166)

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Photograph courtesy of Lieut. G. R. Johnson

A native village in the Peruvian Andes, with its terraced farms, unknown to geographers until this photograph recorded its existence.

AIRCRAFT EXPORT SALESMANSHIP BELOW THE RIO GRANDE

By John Schlegel

Chairman, Export Committee
Aeronautical Chamber of Commerce

THE eyes of the industrial world are focused on Latin America and rightly so. Equality of opportunity, that great stimulus to initiative, is becoming more and more obvious in the countries south of the Rio Grande. It may be said that Latin America is coming into its own, with the result that the purchasing power of 105,000,000 Latin Americans is expanding at an accelerated pace.

It is no wonder that our friends across the Atlantic are making desperate efforts to intrench themselves again in this tremendously potential market. As we all know, the Prince of Wales, England's "Ambassador of Commerce," has just arrived in Argentina to inaugurate the British Industries Fair. Not so long ago Italy sent a squadron of flying boats to Brazil, and Germany is once more a contender for Latin American commerce through her effective methods of slow penetration. Germany is today second only to the United States in volume of exports.

Spectacular salesmanship may in some cases gain a temporary advantage, but salesmanship scientifically planned and conducted twelve months in the year will in the long run prove the most effective and profitable method for permanent results.

A spirit of genuine friendship and a sincere desire to be of service by actually helping them overcome the many obstacles in the development of aviation are essential prerequisites. Strict adherence to these principles is responsible for the enviable position enjoyed by the Fairchild Airplane Manufacturing Corporation in Canada. It is interesting to note that of a total of 310 United States airplanes imported into Canada over a period of three years eighty-seven were Fairchild. The total comprised thirty-eight different makes and the nearest competitor exported twenty-six. In other words, Fairchild secured twenty-eight per cent of the Canadian business. The number of Fairchild airplanes exported to China, Japan, Mexico, Bolivia, Chile, Peru, Argentina, Venezuela, etc., can be largely attributed to observance of these principles.

As most of us are undoubtedly aware, Latin America is more than two and one-half times as large as the United States, but few probably realize that it has less than one-third our railroad mileage. Argentina, for instance, is four times the size of Texas, with but one-fourth the railroad mileage of the Lone Star State. The area of Brazil and Argentina alone is one and one-half times as large as the United States. It is not difficult to visualize, therefore, the very important part that aviation will play in the future development of Latin America.

Like the rest of the world, it has not escaped the recent general economic depression, but it is weathering the difficulty well. The many recent changes in governments have helped greatly to accelerate the period of recovery. Everything tends to indicate that they are definitely on the upward swing.

American aircraft manufacturers as a whole are now busy in technical research and development work generally, and are apparently overlooking the very important matter of developing a market for their products in Latin America—the greatest potential market today. A better appreciation of the importance of the Latin American market may be gained from consideration of the fact that more than twenty-two and one-half per cent of the value of airplanes produced in the United States during 1930 was exported to Latin America.

The potentiality of that field is obviously of such import that it should be a careful consideration at all times in connection with the development of different types of airplanes. It may be said that the automobile has paved the way for the reception by Latin Americans of anything mechanical of American manufacture, and automobile history may repeat itself in the aviation industry.

The present moment is undoubtedly most opportune in which to analyze thoroughly those markets if the aircraft manufacturer is to be prepared to take advantage of the favorable conditions which, it is anticipated, will prevail six to eight months hence.

It is almost superfluous to say that such an analysis should be made on the spot by an expert versed in aviation problems, who has also a knowledge of the language and customs of the people. It is equally important that the channels of distribution be selected through personal contact.

The investigator will find that the Latin Americans who are interested in aviation keep abreast of current developments in aircraft and the prices at which new and used equipment is offered in the United States. Not a few obtain this information from our aviation publications, particularly when a supplement is printed in Spanish; others obtain it from Spanish publications which are alert to the pulse of our industry.

Some manufacturers not well informed continue to make the grave mistake of sending literature in the English language, instead of in the Portuguese language to Brazil and in Spanish to the rest of Latin America.

Strange as it may seem to the technical man, eye appeal is a tremendously important factor in influencing the purchase of planes by our southern neighbors. The first impression is usually a lasting one, and although an airplane may embody the last word in engineering achievement, its finish, fleetness and streamline will be important considerations in final selection. This does not apply, however, in the case of military equipment, but it does affect the saleability of transport equipment to some degree.

Servicing holds a place of paramount importance in any aircraft sales program. A person purchasing an airplane six or eight thousand miles from the factory wants some assurance that his airplane will be readily serviced and repaired after purchase. This is one phase of any sales program which cannot be overlooked, because the product of the manufacturer will gain (*Continued on page* 47)

PRECEDENTS TO GUIDE THE AERONAUTICAL EXPORTER

By Francis H. Love

President, United Aircraft Exports, Inc.

AERONAUTICAL manufacturers of the United States have been able to profit greatly, especially in the field of exports, from the experience they have obtained through a study of the history of the automobile industry. For the last twenty years this latter group, through the trial and error method, has worked out export organizations and systems which operate on a relatively efficient basis. They themselves have learned and have taught others much on how to avoid the more elemental mistakes in approaching foreign markets.

Twenty years ago there were no experienced foreign automotive dealers. In their desire to expand immediately, manufacturers gave agencies almost indiscriminately to anyone in a foreign country who chose to apply. Practically any merchant with good financial standing and a good general business reputation in some other industry —hardware, machine tools, or what not—was eligible for a dealership. In the years that have passed automobile men have learned that an intelligent foreign sales agent specially trained for his task will far outdistance in his work the ordinary good business man formerly chosen.

In general, the aeronautical industry, profiting from this experience, is endeavoring to appoint only agents who indicate a specific interest in the aeronautical trade and who are sufficiently intelligent to absorb such training for the distribution of aeronautical products as is furnished them. I do know, however, of certain large manufacturers of aircraft and equipment who, in their zeal to enlarge their export market, have in the course of a few months appointed agents in almost every country regardless of their particular merit. This, of course, is a great mistake, for a sound foreign agency organization can only be built up over a period of several years of painstaking effort and through a policy of selecting the agents in the different countries one by one and gradually training them in efficiency.

Certain errors in merchandising made by the automotive industry are being avoided. Sending out consignment shipments and free samples to agreeable recipients regardless of the use to which the former would be put was an early mistake which the automotive manufacturers made in the old days in developing foreign markets. I had the experience of receiving two consigned automobiles in 1909 in the city of Santiago in Cuba when neither I nor any of the inhabitants knew how to operate one. Certainly the airplane industry is not sending out consignment shipments and free samples to distant points unless it is assured that there is at the destination a person capable of operating and demonstrating the machine.

Again in 1914, when on the west coast of South America, I received a large (at least for those days) shipment of automobiles without a single spare part. The manufacturer contended that should he send spares it would immediately be an advance concession that his motor car was imperfect and that something might go wrong with it. It is ridiculous to believe that any aeronautical manufacturer today would countenance shipping an (*Continued on page* 238)



American-built airplanes gathered at Mexico City's airport to participate in a meet at that field

LINKING THE AMERICAS BY AIR

By Hon. Clarence M. Young

Assistant Secretary of Commerce for Aeronautics

FORTY-FOUR per cent or 72,000 of the 172,000 miles of airlines in regular operation in the world are in the Western Hemisphere. The twenty-one republics, the Dominion of Canada and the several colonies, nearly every one of which is served by one or several airlines, cover some 15,000,000 square miles and have a total population of about 233,000,000. Thus, about one-eighth of the people of the earth or about one-fourth of the land employ nearly half of the air services.

All forms of transportation have to adapt themselves in varying degrees to geographical conditions. Air transportation is no exception, and a better picture of the progress being made towards providing North and South America with the all-important air transport lines can be obtained if we take a bird's eye view of the South American continent.

It is roughly in the form of a vast triangle, short side to the equator, with a high mountain ridge running the entire length of the western side. This is the greatest mountain area in the world in height and expanse; and the great central plateau in Peru, Bolivia and northern Chile, from 300 to 600 miles across and more than 10,000 feet above sea-level, is only exceeded in altitude by the Himalayan Plateau in Tibet. For a distance of 3,300 miles, the Andes range has few passes lower than 12,000 feet, and many of the passes exceed Pike's Peak in altitude. Another range of mountains runs across the continent in the north, approximately parallel to the equator. Between these mountain ranges lie the lowlands of the continent—the Amazonian forests of Brazil, the pampas of the River Plate, the llanos of Chile and the Gran Chaco regions of Bolivia and Paraguay. In these are the widely-scattered, but world-important, producing centers of the continent.

It is important to bear in mind that practically the entire South American continent lies east of even the eastern seaboard in the United States. The west coast of South America lies for the most part directly south of New York, and consequently the easternmost cities of South America are far closer to Europe than they are to the United States, at some points 500 or 600 miles closer.

There are two roughly parallel land connections between the two North and South American continents. They are, of course, Central America and the Isthmus of Panama, and the long chain of islands running northwest and southeast from Florida to Trinidad, with water jumps of varying lengths up to approximately 120 miles.

These land bridges form natural courses for air transport connection between the two continents. The American countries are much alike from the point of view of geography and distances. They are among the newest and, in many respects, the more advanced great regions of the world. New inventions and new modes of transportation are more in use, and the demand for speed in transportation is greater than anywhere else.

Distances in North and South America, measured between centers of population and business, and places of manufacturing, farming, mining and lumbering, are enormous. The two continents are less thickly populated than are most others, but their output of produce and products is greater. These factors explain the greater volume of transportation by surface means.



The importance of these two continents to one another cannot be over-estimated. Without minimizing the cultural aspect of this connection, we may point out the vast material importance. As for the United States of America—one-fifth of its vast volume of experts goes to Latin America, and one-quarter of its imports comes from that region. The value in each case has reached as high as one billion dollars a year. The fact that the United States obtains many vital raw materials from Latin America further illustrates the importance of this trade.

Of course, at present, only a very small part of this trade can be carried on by air. The immediate prospect is to expedite mail and express deliveries. The advantages gained from speedy international mail services are those derived from the ability to place orders, bills and other documents involved in trade in the hands of the buyer or seller ahead of business competitors. It has been said that trade follows improved communications and transport, and the history of trade development bears this out.

Another service performed by air mail transportation is in the saving of interest by reducing the time on remittances of bank drafts which account for the bulk of payments made in our international transactions. Assuming that air mail effects, on the average, even a six-day saving, or a saving of twelve days on the round trip, there would be a saving of $4,000,000 in interest alone on our trade with Latin America, this amount representing a clear gain, because funds are idle in course of transport.

Air express offers important possibilities for the transport of valuable and perishable commodities. Merchants tend to carry only small stocks of such items, and they are much better able to do this where there is the possibility of having small replacement orders transmitted very rapidly. As a rule these commodities—such as jewelry, perishable food stuffs, silks for the tropics—are well able to bear the slightly increased transportation cost. As improvements in airplanes are made, the list (*Continued on page* 234)

AMERICAN AIRPLANES IN THE LATIN-AMERICAN REPUBLICS

By John S. Allard
Vice President, Curtiss-Wright Export Corporation



THE publication of this splendid issue of AERO DIGEST, giving as it does a complete directory of airworthy American commercial airplanes in current production, provides an appropriate occasion to consider some of the special reasons for the cordial relations existing between American Republics in the romantic and utilitarian field of aeronautics. The very fact that in the Inter-American section every plane is described in Spanish, the mother tongue of the majority of these Republics, although the magazine is published regularly in English, is noteworthy, but, at the same time, eminently reasonable.

The truth is that the Americas—the New World—have almost throughout their entire area a pressing need for aviation as much to aid in the pursuit of happiness as in the promotion of business enterprise. Not only can the airplane increase the speed of transportation—in itself a valuable factor—but the airplane can render accessible cities and countries hitherto too difficult to visit as well as too remote in point of distance.

In the Americas, both North and South, there exists the widest range of variety from the geographical point of view—the tropics, the temperate zones, the cold climates, the plains, the mountains, in short everything scenic that is beautiful, healthy and desirable. Furthermore, one finds every form of industry in, and commerce between, the different areas. Travel, in connection with trade, is constantly necessary and the number of travelers large.

In another sense, quite apart from trade, travel is also a vital part of American lives. Because of the prodigal distribution of natural resources in the New World, the standard of living is high and few are the families whose members are unable to indulge in the advantages of change generally referred to as vacations. Many Americans visit Europe annually, but still more take their recreation by visiting places in the Americas, but away from their usual homes. For example, many citizens in the United States travel during the winter to Cuba, Mexico and other American Republics. Then, too, many American families, whether in the Argentine or the United States, maintain country and city homes. This necessitates frequent travel from the city to the country and from the country to the city.

For all this travel, the airplane is becoming increasingly the chosen vehicle of those who can afford its speed and luxury.

In Guatemala, to bring up a case known to all, many wealthy citizens spend most of their lives on their plantations, going seldom to enjoy the social pleasures of life in the city. These plantations are not in many cases far removed from the centers of urban gaiety; yet the roads are difficult to traverse and the only possible transportation is by automobile or horse. As a result, the owners of such estates are deprived of much enjoyment, a deficiency which is being removed more and more by the use of the airplane.

Soon after the first introduction of the airplane by the Wright brothers in the United States, a number of factories were organized to manufacture various types of aircraft in that country. With the advent of the World War, the number of these plants was augmented considerably. Following the cessa- (*Continued on page 230*)



Curtiss Falcons lined up in front of the Curtiss plant in Chile where they were constructed

THE NATIONAL AIRCRAFT SHOW

Detroit City Airport, Detroit, Michigan, April 11 to 19, 1931

DURING the eleven months which have elapsed since the Aeronautical Chamber's show in Madison Square Garden last year, many changes have come about within the aircraft industry.

Because of its well-known process of eliminating the unfit, the business recession which all industries recently have felt has been called a "blessing in disguise." Many members of the industry have prophesied that a healthier, more stable industry will be reborn out of the inflation and chaos that gripped it in the past. At least one prominent member has stated that "an exhibitor's badge at the Detroit Show will be a real medal of honor;" that it will testify to that exhibitor's strength and worthiness of purpose, and his fitness to survive the economical indigestion that has waylaid all business.

If these things are so, the industry as a whole can pat itself upon the back. Few familiar faces will be absent at the National Aircraft Show in Detroit, April 11 to 19. The entry list, which embodies a total of fifty-nine airplane manufacturers, entering ninety-five planes, and more than a hundred accessory concerns, contains practically all of the best known names in the industry. Furthermore, the airplane list alone contains more than a dozen names entirely new to the business.

The 1931 National Aircraft Show, as was the Detroit show last year, is being held in the $1,000,000 hangar and administration building at Detroit City Airport. This building, the largest airplane hangar in the world, is 1,014 feet long and 200 feet wide, containing 200,000 square feet of floor space. Despite the size of this structure the industry's rush for exhibition space was such that no space has been available inside the building since the early part of January. Early in March, when the show's overflow had mounted to twenty-four airplane manufacturers with twenty-nine planes and fourteen accessory manufacturers, Ray Cooper, manager of the show, sought and obtained a tented annex, covering more than 30,000 square feet of floor space and the airplane entries will be expanded to the ninety-five airplanes mentioned previously.

That aeronautical engineers have not been idle during the business lull is revealed at the Detroit show by the unusually large number of radically new designs. These new designs also disclose the market toward which manufacturers have been working, one outstanding feature being the numerous entries of light and midget type craft. Approximately one-half of the show's airplane entry list is made up of light airplanes, with more than one dozen of the planes in that category being of the extra light, or midget type. The presence of so many such craft among the show's exhibitors can be construed to mean only that the industry is out to convince the "man-in-the-street" that he can fly. This is especially true when it is seen that the midget plane exhibitors include several of the industry's most substantial firms.

Headed by more than a dozen aircraft engine makers, all of whom have been represented in previous shows, accessory manufacturers are introducing a lot of surprises. This division of the show, alone, is decidedly worth seeing.

In addition to the large number of craft actually entered in the show, almost an equal number are present upon the 260-acre airport adjoining. The airport is well lighted and, as last year, considerable night flying is expected.

The Early Birds, that renowned order of old-timers who found wings before 1917, will make the Detroit show occasion for another get together. Mr. William E. Scripps, publisher of the Detroit *News* and an E. B., is sponsoring a reunion dinner at the Detroit Athletic Club, April 15th. Those of you who wear the owl insignium, and want to participate in this affair, can learn how and where by stopping in at AERO DIGEST's booth, which will be headquarters for the Early Birds for the duration of the show. You'll see the insignium over the booth, and there'll be a fellow Early Bird on hand there to give you all the information you want. Also, you can communicate with James V. Piersol, aviation editor of the Detroit *News*, who is Mr. Scripps' representative in preparing plans for the dinner.

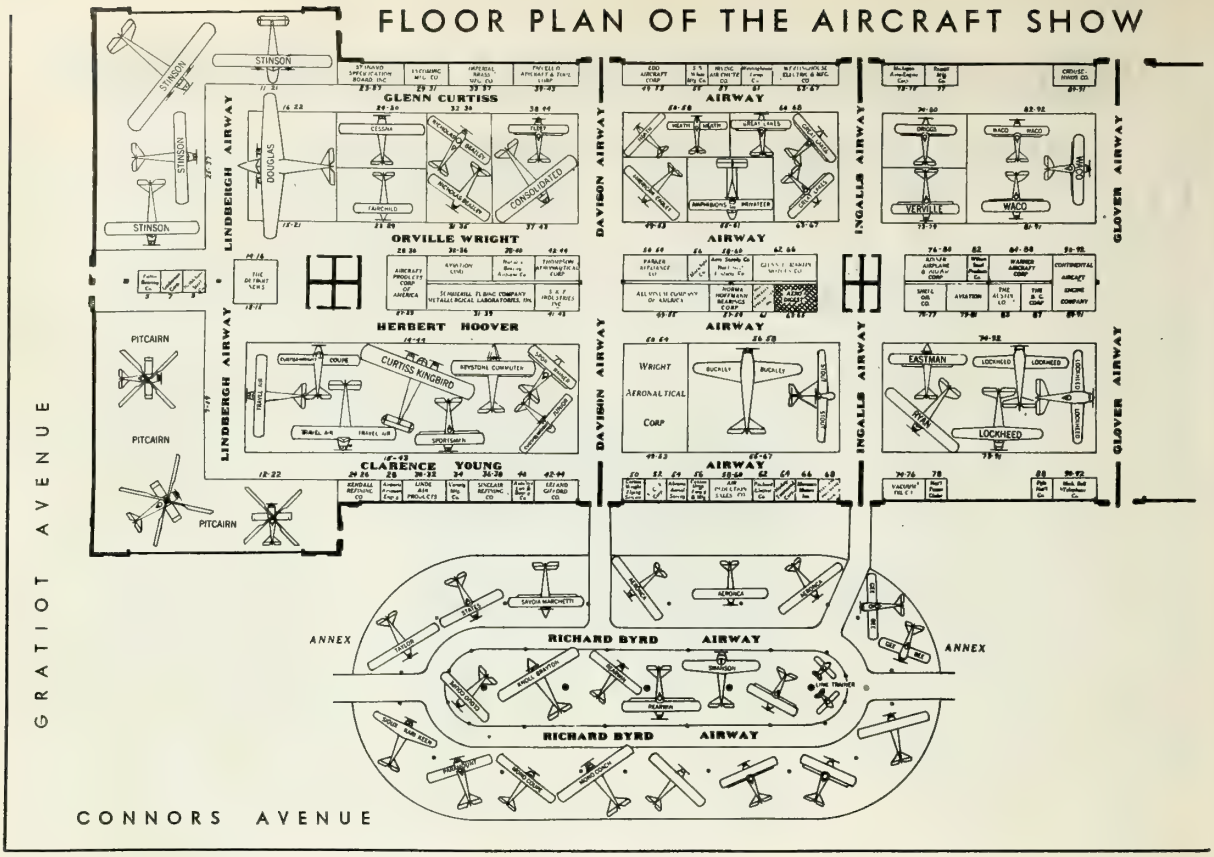
The Board of Control for the show has mailed out 1,000 especially engraved invitations to as many prominent aeronautical and public officials of the United States and Canada. The first of these invitations has been presented to President Hoover. The recipients of the invitations are invited to a special preview of the show being held between two and five p.m. Saturday, April 11. Formal opening to the public is at seven p.m. the same day.

The Second National Conference on Aeronautical Education will be held at the Hotel Statler in Detroit, April 14 and 15, coincident with the National Aircraft Show. This conference is being held under the joint auspices of the Educational Committee of the Aeronautical Chamber of Commerce of America and the Daniel Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education. The first conference of this kind was held last year at St. Louis, and was attended by approximately 100 delegates representing aeronautical educational enterprises throughout the United States. The conference made a considerable number of recommendations which were incorporated in the policies of the Daniel Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education and the Educational Committee of the Aeronautical Chamber of Commerce. Report of progress in carrying out these recommendations will be made at the Detroit conference. Further recommendations will be made and an opportunity presented to discuss the policies and programs to be carried out during the next year.

Another part of the program that should prove interesting is a gliding demonstration scheduled for Tuesday, April 14, between two and four p.m. The demonstration will be opened with the arrival over the airport of a glider towed by an airplane. Following an exhibition of all methods of launching, including auto towing, prominent members of the industry will be invited to try their hand at operating the motorless craft. More than a dozen gliding clubs are participating in the activities.

Still another feature on the program will be the unveiling of a plaque to the memory of the late Captain L. M. Woolson, chief aeronautical engineer of the Packard Motor Company. While a member of the Aircraft Bureau, Detroit Board of Commerce, Captain Woolson suggested the building of the hangar. The bureau is presenting the plaque.

FLOOR PLAN OF THE AIRCRAFT SHOW



ALPHABETICAL LIST OF AIR SHOW EXHIBITS

Showing Their Locations in the Hangar Exhibition Building and the Tent Annex

Airplane Exhibitors

Aeronautical Corp. of Amer., (Anx) Richard Byrd Airway

Amer. Aeronautical Corp., (Anx) Richard Byrd Airway

Amer. Eagle Aircraft Corp., 49-53 Orville Wright Airway

Amphibions, Inc., 55-61 Orville Wright Airway

Bird Aircraft Corp., 97-101 Clar. Young Airway

Bellanca Aircraft Corp., 97-115 Orville Wright Airway

Boeing Airplane Company, 121-133 Clar. Young Airway

Buhl Aircraft Company, 103-115 Clar. Young Airway

Buckley Aircraft Corp., 56-68 Herbert Hoover Airway

Cessna Aircraft Company, 24-30 Glenn Curtiss Airway

Chance Vought Corp., 121-133 Clar. Young Airway

Consolidated Aircraft Corp., 37-43 Orville Wright Airway

Curtiss-Wright Airplane Co., 14-44 Herbert Hoover Airway

Detroit Aircraft Corp., 74-92 Herbert Hoover Airway

Douglas Aircraft Corp., 15-21 Orville Wright Airway

Driggs Aircraft Corp., 74-80 Glenn Curtiss Airway

Fairchild Airplane Mfg. Co., 23-29 Orville Wright Airway

Fokker Aircraft Corp., Woolson Airway

Ford Motor Company, Woolson Airway

Granville Bros. Aircraft Corp., (Anx) Richard Byrd Airway

Great Lakes Aircraft Corp., 60-68 Glenn Curtiss Airway

Heath Aircraft Corp., 50-58 Glenn Curtiss Airway

Knoll-Brayton Aero. Corp., (Anx) Richard Byrd Airway

Mono-Aircraft, Inc., (Anx) Richard Byrd Airway

Nicholas-Beazley Airpl'e Co., 31-35 Orville Wright Airway

Northrop Aircraft Corp., 121-133 Orv. Wright Airway

Paramount Aircraft Corp., (Anx) Richard Byrd Airway

Pitcairn Aircraft, Inc., 7-19 Lindbergh Airway

Rearwin Airplanes, Inc., (Anx) Richard Byrd Airway

Sioux Aircraft Corp., (Anx) Richard Byrd Airway

Sikorsky Aviation Corp., 122-34 Herb. Hoover Airway

States Aircraft Corp., (Anx) Richard Byrd Airway

Swanson Aircraft Company, (Anx) Richard Byrd Airway

Stearman Aircraft Company, 121-33 Orville Wright Airway

Stinson Aircraft Corp., 25-37 Lindbergh Airway

Stout Engineering, 56-58 Herbert Hoover Airway

Taylor Bros. Aircraft Corp (Anx) Richard Byrd Airway

Verville Aircraft Company, 73-79 Orville Wright Airway

Waco Aircraft Comapny, 81-91 Orville Wright Airway

Other Exhibitors

Abrams Aerial Survey Corp., 54 Clarence Young Airway

AC Spark Plug Co., 114-16 Clarence Young Airway

Aero Digest 63-65 Herbert Hoover Airway

Aeromarine Motor Co., 27 Langley Airway

Aeronautical Industry, 140 Clarence Young Airway

Aero Supply Company, 58-60 Orville Wright Airway

Aircraft Products Corp., 28-30 Orville Wright Airway

Airports, Aviation Engineering 28 Clarence Young Airway

Air Reduction Sales Co., 58-60 Clarence Young Airway

Airway Age, 108-10 Orville Wright Airway

Aluminum Company of America, 49-55 Herbert Hoover Airway

American Cirrus Engines, 52 Clarence Young Airway

American Gas Accumulator Co., 106 Clarence Young Airway

The Austin Company, 83 Herbert Hoover Airway

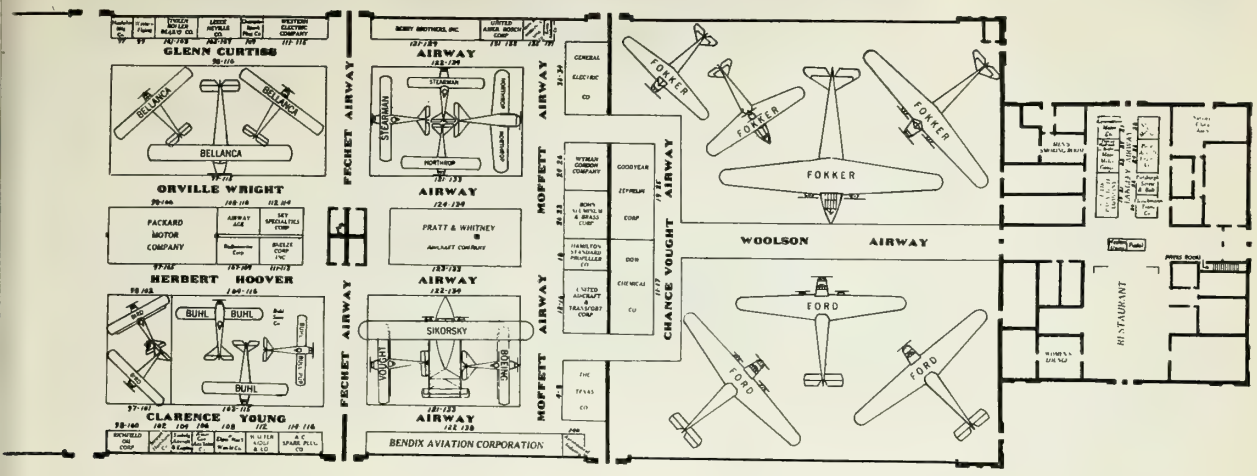
Automotive Fan & Bearing Co., 40 Clarence Young Airway

Aviation, 79-81 Herbert Hoover Airway

Aviation Corporation, 32-36 Orville Wright Airway

Bendix Aviation Corporation, 122-38 Clarence Young Airway

DETROIT, MICHIGAN, APRIL 11TH TO 19TH, 1931.



Berry Brothers, Inc.,
121-129 Glenn Curtiss Airway

Bethlehem Steel Co.,
9 Herbert Hoover Airway

The B. G. Corporation,
87 Herbert Hoover Airway

Bohn Aluminum & Brass Corp.,
20-22 Moffett Airway

Breeze Corporation, Inc.,
111-13 Herb. Hoover Airway

Canton Drop Forging & Mfg. Co.,
56 Clarence Young Airway

Champion Spark Plug Co.,
109 Glenn Curtiss Airway

The Cleveland Pneumatic Tool Co.,
68 Clarence Young Airway

Continental Aircraft Engine Co.,
90-92 Orville Wright Airway

Crouse-Hinds Company,
89-91 Glenn Curtiss Airway

Curtiss-Wright Flying Service
50 Clarence Young Airway

The Detroit News,
14-16 Orville Wright Airway

Detroit Hydraulic Brake Systems,
25 Langley Airway

Dow Chemical Company,
11-17 Chance Vought Airway

Edo Aircraft Corporation,
49-53 Glenn Curtiss Airway

Elgin National Watch Co.,
108 Clarence Young Airway

Ex-Cell-O Aircraft & Tool Corp.,
39-43 Glenn Curtiss Airway

Evans Appliance Co.,
137 Glenn Curtiss Airway

Fafnir Bearing Co.,
5 Herbert Hoover Airway

Fleischmann Transportation Co.,
20 Langley Airway

General Electric Company,
30-34 Moffett Airway

Glenn L. Martin Motors Co.,
62-66 Orville Wright Airway

The Goodyear Zeppelin Corp.
19-25 Chance Vought Airway

Guiberson Corp.,
7 Herbert Hoover Airway

Hamilton Standard Propeller Corp.,
18 Moffett Airway

Haskelite Manufacturing Co.,
97 Glenn Curtiss Airway

Hill Aircraft Streamliners Co.
61 Herbert Hoover Airway

Hurley-Townsend Corporation,
64 Clarence Young Airway

The Imperial Brass Mfg. Co.,
33-37 Glenn Curtiss Airway

Irving Air Chute Co., Inc.,
57 Glenn Curtiss Airway

Kendall Refining Company,
24-26 Clarence Young Airway

Walter Kidde & Company, Inc.,
112 Clarence Young Airway

Kinner Airplane & Motor Corp.,
76-80 Orville Wright Airway

The Leece-Neville Company,
105-107 Glenn Curtiss Airway

Lee Machinery Company,
28 Langley Airway

Leland-Gifford Company,
42-44 Clarence Young Airway

The Linde Air Products Co.,
30-32 Clarence Young Airway

Link Aviation Trainer Sales Corp.,
(Anx) Richard Byrd Airway

Lycoming Manufacturing Company,
29-31 Glenn Curtiss Airway

Macwhyte Company,
56 Orville Wright Airway

Menasco Motors, Inc.,
66 Clarence Young Airway

Metalurgical Laboratories, Inc.
31-39 Herbert Hoover Airway

Michigan Aero-Engine Corporation,
73-75 Glenn Curtiss Airway

Michigan Bell Telephone Company,
90-92 Clarence Young Airway

Motor Meter Gauge & Equipment Corp.,
23 Langley Airway

National Air Pilots Association,
Field Office

National Power Glider & Airplane News,
78 Clarence Young Airway

Nicholas-Beazley Airplane Co., Inc.,
38-40 Orville Wright Airway

Norma-Hoffman Bearings Corporation,
57-59 Herbert Hoover Airway

The Packard Electric Co.,
62 Clarence Young Airway

Packard Motor Car Company,
97-105 Herb. Hoover Airway

The Parker Appliance Co.,
50-54 Orville Wright Airway

Pittsburgh Screw & Bolt Corp.,
22 Langley Airway

Poyer Aircraft Engine Co.,
24-26 Langley Airway

Pratt & Whitney Aircraft Co.
124-34 Orville Wright Airway

Pyle National Company,
88 Clarence Young Airway

Radiomarine Corporation,
107-09 Herb. Hoover Airway

Richfield Oil Corp. of N. Y.
98-100 Clarence Young Airway

John A. Roebling's Sons Co.
135 Glenn Curtiss Airway

Russell Manufacturing Co.,
77 Glenn Curtiss Airway

Shell Petroleum Corporation,
75-77 Herbert Hoover Airway

Sinclair Refining Company,
36-38 Clarence Young Airway

S. K. F. Industries, Inc.,
41-43 Herbert Hoover Airway

Sky Specialties Corporation,
112-14 Orville Wright Airway

Stanavo Specification Board, Inc.,
23-27 Glenn Curtiss Airway

Summerill Tubing Company,
31-39 Herbert Hoover Airway

Switlik Parachute Co.,
19-21 Langley Airway

Szekely Aircraft & Engine Co.,
104 Clarence Young Airway

The Texas Company,
4-8 Moffett Airway

Thompson Aeronautical Corp.,
42-44 Orville Wright Airway

The Timken Roller Bearing Company,
101-103 Glenn Curtiss Airway

United Aircraft & Transport Corp.,
12-16 Moffett Airway

United American Bosch Corporation,
131-133 Glenn Curtiss Airway

Vacuum Oil Company,
74-76 Clarence Young Airway

The Variety Manufacturing Company,
34 Clarence Young Airway

Warner Aircraft Corporation,
84-88 Orville Wright Airway

Western Electric Company,
111-115 Glenn Curtiss Airway

Western Flying
99 Glenn Curtiss Airway

Westinghouse Electric & Mfg. Co.,
63-67 Glenn Curtiss Airway

Westinghouse Lamp Co.,
61 Glenn Curtiss Airway

The S. S. White Dental Mfg. Co.,
55 Glenn Curtiss Airway

Wilson Steel Products Co.,
82 Orville Wright Airway

Wright Aeronautical Corp.,
50-54 Herbert Hoover Airway

Wyman-Gordon Company,
24-26 Moffett Airway

EVOLUTION OF THE PILOT

by Caldwell

ANYONE who wore himself out on my history of aeronautics in the January issue of AERO DIGEST—in which I pointed out the supernatural influences that have given aviation a boost at unexpected and irregular intervals—may have felt stealing over him a longing to have me follow that research with a scientific treatise on the pilot himself. Then again, he may not. However, I feel impelled to dig into the history of the pilot and trace his evolution from the prehistoric era down to the present day.

In this labor I had intended to seek the assistance of that famous naturalist, Charles Darwin, whose monumental work, "The Descent of Man With the Assistance of Silkworms," shook the scientific world of the last century. But on looking him up I find that he passed away in 1882, so I may expect no help from that quarter. I must therefore attack this colossal task alone, borne up only by my native strength of character and my trust in the inherent virtue of the Republican party. I can only pray that my senses may not fail me before the conclusion of this herculean task, which I expect will rival in erudition and scope, if not in length, Buckle's History of Civilization in seventy-two volumes and twenty-four easy payments. He who runs may read, and he who moves may baffle the collector—so says Confucius.

My first researches into the history of the pilot led me into the Stone Age and the later Concrete Age. In fact, practically all of this material was dug up in the basement of the New York Public Library. I started with a pick, but it was not until near the end of the nineteenth century and the invention of the pneumatic drill and the steam shovel that I made any appreciable progress in my archæological researches. Following the demise of Queen Victoria, who always depressed me, my work went ahead at a great rate, and I was removing each day more than seventeen tons of debris and back numbers of magazines, until I came across a photograph of Queen Mary's hat, which caused a partial mental paralysis in myself and the total collapse of the east corner of the New York Public Library.

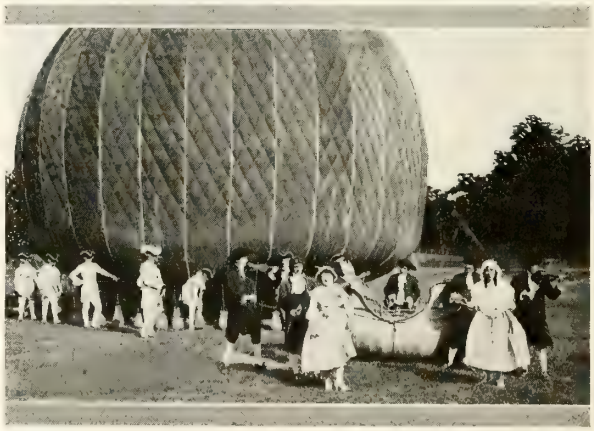
In this disaster, unfortunately, I lost some of my notes. But from the wreckage I have retrieved the fact that the first human, (or practically human) being who ascended from the earth was Jean Francois Pilatre de Rozier, a Frenchman (1756-85). As he seems to be the dawn man of the flying era, I have named him *Pithecanthropus erectus hop-offus.* It seems he was superintendent of the natural history collection of Louis XVI, of France, so it is safe to assume that one of the heavier specimens must have dropped on his head. I can assign his flight to no other reason. On October 15, 1783, and following days, he made several flights in a captive fire-balloon, but, to the disappointment of the spectators, survived.

However, he was not the first living thing to take to the air, or rather, to be shoved into the air. On September 17, 1783, the Montgolfier brothers had sent up a sheep, a rooster and a duck, who were thus the first aerial travelers. The first air accident, incidentally, was not caused by a crash after flight, but by the sheep kicking the rooster before the ascent. The Department of Commerce might well take the hint from that sheep and kick some of our own modern roosters before they take off for some aerial absurdity; in fact, they've done that in some few instances. More power to them.

If I may be pardoned a brief personal note before being carried on by the sweep of this great historical survey, may I inject here the record of my own evolution, as a pertinent comment on the evolution of all pilots. I really hate to talk about myself, but candidly, I know of no more interesting subject to me than me; and after all I'm the only subject in the world I know everything about—including the worst. Were I to discuss you, for instance, I would be discussing a subject who has spent a life-time keeping the worst about himself as secret as possible. But when I discuss me, I discuss something of which I know the worst, and may let out as much or as little of it as I see fit.

Now, just as every individual in his own evolution goes through the evolution of the race since time immemorial and possibly immoral, just so have I, as a pilot, gone through the same evolutionary process that the new pilots are going through today. I too stood before the machine, havin' my pitcher took. I, too, glanced about to see if the people were looking at me, and admiring me as I prepared to go up and defy the elements.

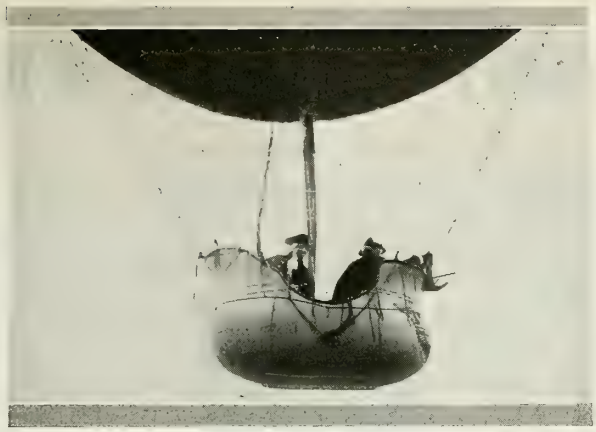
Now it came to pass on various occasions that while acting in the capacity of attention-caller to myself I became so engrossed in my work that I very nearly smacked myself against the earth. Of course, the world is not without people who maintain that such a consummation would have been agreeable—but let that pass. To me it became evident that if I persisted in my aerial advertising that something drastic would happen. So I gradually slowed down. Other pilot friends of those dear dead days either slowed down themselves or were brought to a sudden stop. It took about six close shaves to convince me that vertical banks two feet above the earth and loops



Natural Advisory Committee for Aeronautics making one of its valuable contributions to the science of aviation, assisted by five of the Four Marx Brothers, Texas Guinan and Edna Wallace Hopper, July, 1776. No wonder Washington crossed the Delaware

at 300 were not conducive to longevity, no matter how far they might advance my cause with the fair, or fairly fair, sex.

Incidentally, in my more serious moments I was assisting a few of the boys to stage a little war, while a flock of Generals and the entire Allied navies, with the exception of the destroyer fleets, looked on. The calisthenics we indulged in over the lines also served to cramp my dashing style, while the machine-gunners and anti-aircraft wallahs convinced me of the truth of the statement, "the higher the fewer." In fact, by the time my part of the war ended it took a powerful telescope even to pick me up while over the lines.



Jack Berry and Floyd Logan, famed aeronauts, surveying Cleveland Airport in their balloon, "The Gravy Boat." (From an early print in the Peggy Rex Collection)

Then came peace, blessed peace, and partial starvation. I shall not trace my devious course about this country, the West Indies and Canada in search of a living, for after all in this great treatise on the evolution of the pilot I am merely laying myself on the dissecting table as a sacrifice to science. I am the single monkey the vivisectionist carves up in an effort to learn something about the whole tribe of monkeys—just an average specimen. I went hither and thither, doing this and that, learning so-and-so and such-and-such, and slowly building up a fund of experience that I could use as ashes to scatter over the slippery ice of danger that Fate congeals in the paths that all of us must tread.

In short, as the years sped by I left behind the exuberance and daring of youth, the exhibitionism natural to the male of the species when in the presence of the female, and became less of a menace to myself and others in the immediate vicinity. Another way of looking at it is that Time had removed from me the vim, verve, and vivacity that had caused me to do so many things, and that I was wearing out. Be that as it may, I know that I was safer to travel with when half worn out than I ever had been at the summit of my exuberant powers.

Now if you have the picture of the evolution of one old pilot well in mind, we'll go on to study the whole group. And if you haven't it in mind, we'll go on anyhow. For Time, Tide, and old man Caldwell wait for no man—and only a few women.

Fossil remains of pilots who lived during the Early Air Age offer proof that the species soon divided itself into two distinct classes—the Creative class and the Using class. Those early pilots with inventive or mechanical ability naturally became the class who designed and built airplanes. As this took up most of their time they soon reached the stage where their entire efforts were devoted to this phase of the art. Working indoors under artificial light and breathing an atmosphere mixed with dope, paint, iron filings, and lead-pencil shavings, they soon broke out with eye-glasses, derby hats, starched collars and dandruff. Their further evolution took them to directors' meetings, bankers' conferences, and suites in the best hotels, where we leave them to follow the fortunes of the second, or Using class of pilots.

These were the pilots who did the air work. Of course, without the inventive brains and the manufacturing and business ability of the other class, they would have had nothing to fly. Each class was dependent on the efforts of the other. But as the Creative class is now sitting comfortably dug in, financially speaking, it need no longer be considered in the class with the pilot actually flying today. Therefore it is he that we must study, from his early beginnings, if we would understand the position he occupies now. He is not an inventor, a business man, an organizer—or if he is, he eventually gets out of piloting, at least as his main profession. He is the lad who shoves the airplane from here to there, without whose ecorts the manufacture of airplanes would be useless, for there would be no one to fly them.

The pilots of the dawning Air Age, research shows, were known as Hangar Dwellers, because at night they crawled within the cavernous gloom of the airplane stable and wrapped themselves in bits of fabric from the last crash. This vanished race of Hangar Dwellers has left behind it crude drawings on the walls of some of the more ancient retreats, showing that even in that far-off day the practice of writing names on the inside of telephone booths had started. During the daytime, these ancients came forth and took off to hunt the dinosaur and the sabre-toothed tiger. They were mounted on early Wrights, Curtisses and other old wood-burners.

However, what we are concerned with here is not so much a survey of the physical life of the pilots of the Pre-airmail Era, as it is of the mental life, if any. What, psychologically speaking, were they thinking of? Well, in general they were following the lead of little Jack Horner who sat in a corner eating a Christmas pie, and who put in his thumb and pulled out a plum and said what a smart boy am I. And why not? These fellows were the first generation of men to fly—the early balloonists weren't flying, they were floating. They put in their thumb and pulled out the plum of heavier-than-air powered flight. Of course they were smart boys.

As the years went by, and generation followed generation, the pilots of the Pre-war, Pre-airmail Eras found that the battle for existence in a world where ham and eggs were not donated, even to pilots, could be won in only one way—by putting on exhibitions of flying. So the old boys started off as exhibition fliers. They flew at country fairs, vying with the two-headed calf and the rubber-skinned cannibal from Zanzibar in an effort to startle the yokels. Aviation was a show, and they were the showmen. Practically every one of the old pilots was an embryo Barnum, presenting himself as the main exhibit.

The war did not change this fundamental background of the pilot; on the contrary, it emphasized it. He was still the main show. The very nature of the war catered to this conception. On the ground there was stagnation. The Hindenberg line held the (*Continued on page* 240)

AIR—HOT AND OTHERWISE

What Was Wrong With Problem XII?

By Frank A. Tichenor

IF we attempt to understand why little Johnny mentioned in the Third Grade Arithmetic gave four of his twelve marbles to his sister, Sue, six to his little brother and two to the boy next door with the only result confusion as to how many he would have left, we will never find any satisfaction by looking in the back of the book. But at least the answer to the problem is there.

Herein do we detect a slight difference between Third Grade mental arithmetic and naval maneuvers. In regard to the latter not only are we left guessing as to the outcome of the problem, but we are sometimes at a complete loss to understand the viewpoint or the state of mind which thought up the simulated conditions and confusing factors which go to make a naval tactical problem.

On February 21 last with the combined Atlantic and Pacific fleet deployed in simulated battle conditions all over the broad expanses of the Pacific off Central America and the Panama Gulf, the first phase of the annual combined fleet maneuvers came to a close. For several days previous the surface force, the control force and the aircraft divisions had been engaged in seeking the correct tactical answer to a sea battle maneuver which has been called Problem XII.

Yet we are still waiting for the answer. The silence following the General Critique which was held a week after the first phase closed has been profound—the silence, that is, on the vital point of who won and who lost, which a slight study of military history leads the ignoramus to believe is the main objective of fighting.

But even before the high command could get together (one would have thought for the purpose of answering this vital question but apparently it was merely to suppress a definite conclusion as to whether or not two aircraft carriers can hold our entire Battle Fleet at bay) Admiral William V. Pratt, Chief of Naval Operations who witnessed the maneuvers from the bridge of the battleship *California*, tied fast to the pier at Balboa, announced in stentorian phrases:

"I came down here to see if the results of this problem would support my views that the battleship is the backbone of the fleet; and I am more certain than ever that the battleship cannot be replaced by the plane.

"The assertion that the plane can take the battleship's place is piffle, and anyone who says that doesn't know what he is talking about, or else he wants to get something for nothing—an efficient navy without expense. It can't be done without battleships, and you don't have to be mealy-mouthed about it in saying I said so."

On one point Admiral Pratt may have no concern. No one is going to be "mealy mouthed." Let him forget his worries on that score, but in casting back over the Admiral's renewed defense of battleships we are left with a slightly disturbing suspicion that he has been peeking in the back of the book, and that the answer which he saw there was highly displeasing to one who had already guessed the answer and guessed it incorrectly. Anyone who has not lost all memory of his school days and is still capable of recalling the predicament of the delinquent student who fudged the answers by looking in the back of the book can appreciate Admiral Pratt's feelings.

Admiral Pratt, like Johnny in the Third Grade Arithmetic, gave all of his marbles away—a fact that he apparently wasn't aware of until he had looked in the Correct Answer column in the back of the book, and so there was nothing left for him but to say that the marbles weren't any good anyway. At the outset of these remarks on what was wrong with Problem XII, I advanced the claim that the teachers who make up the problems never bother to explain the actions of the people who figure in them—we never are told why Johnny had to give away all those marbles.

But perhaps with a closer study of Problem XII we shall find a little internal evidence which will give us a clue, at least, to the psychology and sympathies of the mind that framed it.

The workers in aviation who are gladly expending their lives for that most essential thing—An Aviation Navy—can perhaps be forgiven for a slight display of overoptimism at times.

If there has been an appearance occasionally of overemphasis on naval aircraft, I can think of no greater tribute to the efficiency and efficacy of the men working for this honorable goal that this should be so. It is not to be wondered, then, that when Problem XII was at last made public and everyone saw that the master minds among our naval tacticians had given to a light scouting fleet, supported only in the matter of striking force strength by two first-line aircraft carriers, the task of simultaneously repelling at two widely separated points—the Panama Canal and Nicaragua—an enemy fleet of battleships, the starved enthusiasts of aviation threw their hats high in the air. But when the problem was more closely studied by these persons who had been waiting vainly for years to demonstrate the usefulness of aircraft afloat as a striking weapon comparable to battleships, they realized that the thing had been laid on a little thick. Careful readers of Problem XII cannot escape a surprised ejaculation that aviation had never been given a more difficult or stupendous task.

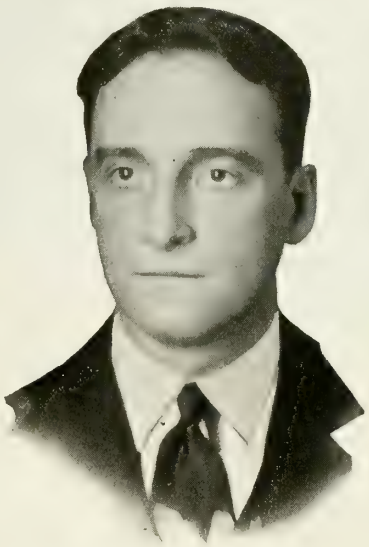
It would be easy to work out from this factor alone a good defense as to why the aircraft strength of the *Lexington* and the *Saratoga* did not provide a clear-cut and decisive victory for the defense fleet in the opening phase of this year's maneuvers. But there is something more important to be uncovered here. Here is the fact: this much mentioned Problem XII, which at first blush seems to be the answer to the prayer of every naval aviation enthusiast, is and could be the product of one type of mind alone—that of an inveterate and confirmed opponent of aviation.

At this point it may be worth while to look into a rather mysterious move which the defense fleet, supported as previously stated, by the two aircraft carriers, was led to make for no very clear reason. In all of the estimates of Problem XII considerable emphasis is placed on this factor; that in the attack of the enemy "Black Fleet," consisting of most of the Battle Fleet (a very superior floating gun powder), no neutral

(*Continued on page* 238)

ANALYSIS OF AVIATION EXPORTS

By
Leighton W. Rogers
Chief, Aeronautics Trade Division
U. S. Department of Commerce



PROBABLY the major cause of the favorable status of overseas trade in United States aeronautic products during the past two years is the fact that the profitable utilization of aircraft within the United States increased so materially during this period. This is especially true of the year just past which was not handicapped, as were 1928 and 1929, by the artificial and inflated condition forced on some phases of the aviation industry. Colonel Clarence M. Young, in his article in this issue, indicates that last year the number of passengers carried on intra-United States airlines increased 217 per cent over those carried during the year preceding; and that both mail and express poundage increased. These record totals were reached in spite of the generally depressed business conditions prevailing.

The overseas sale of United States military aircraft—about ninety of the 321 aircraft exported last year were military—is believed to be the result of the growing realization that the air force tactical problems of this country are more nearly analagous to those of most overseas territories than are the conditions which are being met so successfully in Europe by European aircraft producers. The long distances traversed, the rugged terrain, often adverse weather conditions, wide divergence of temperature and elevation make the United States an unique and valuable proving ground for the operation of aircraft, both civil and military.

Reaching twenty-nine markets not sold during 1929, the American aeronautical industry nearly equalled the record volume of foreign trade of 1929 and shipped more than $8,800,000 worth of products abroad last year.

Although production of United States civil and military aircraft during 1930 was almost one-half that of the previous year, exports of aeronautic products, which could be definitely identified as such from official figures, were but slightly under those for 1929. Greater attention to overseas business on the part of the industry, the availability (for the first time during the year) of airworthiness certificates for export from the Aeronautics Branch of the United States Department of Commerce on all export shipments, and price reductions, are believed to be among the factors contributing to the favorable status of this trade. The airworthiness certificate for export is predicated on the rigid inspection system of the Aeronautics Branch. Before a civil airplane, seaplane or amphibion is considered suitable for export by the Aeronautics Branch of the Department of Commerce, there are three stages of inspection and test to be executed. These three stages assure the purchaser that the aircraft accompanied by the aforementioned certificate will be a credit to United States design, workmanship and airworthiness. The three stages are as follows: (1) Detailed stress analysis of each model in production; (2) continuous inspection of workmanship, materials and fabrication methods, as well as investigation for the purpose of assuring the Aeronautics Branch that the factory is suitably equipped to produce and is producing its aircraft in exact conformity to "approved type"; and (3) flight tests by Aeronautics Branch inspectors. After these steps in the inspection system are concluded, the particular type of aircraft is granted an Approved Type Certificate which after inspection of each individual unit qualifies it for license. The aircraft, accordingly, is eligible for export under an Airworthiness Certificate for Export.

Export of all aircraft, engines, parts (except spare tires) and accessories (except parachutes and some instruments) from the United States during 1930, were valued at $8,806,396 as compared with a valuation of $9,202,385 for the preceding year, which was the peak year for shipments of these items. The 1930 figure is well over twice the value of these exports in 1928. The percentages of exports to production during the three years were ten, six and four, respectively—a gratifying trend, which, among other indications, shows that the aeronautical industry is awaking to the desirability of cultivating the overseas markets.

The average unit value of the 1930 shipments was $15,000, which was $1,200 less than the 1929 average. Lowered prices are believed to have contributed only in small measure to the maintenance of this trade during 1930, since gliders, which were exported for the first time during the year, are included in the export statistics for complete aircraft.

It is interesting to note that, while our aeronautic exports decreased less than $400,000, those from Great Britain (amounting to about $9,970,000) represented a decrease of approximately $660,000 under the 1929 shipments. A good share of Great Britain's trade in these items, of course, went to her colonies and dominions, but there were evidences during the year that the British aircraft industry —more dependent than our manufacturers on overseas markets—is making every effort to develop its foreign business. Prior to 1930, its major export business was in light sport and training types, which, because of the subsidized flying clubs in England, had been well developed. During 1930, however, medium-sized transport and light cabin planes were made available by the British industry. Details as to countries of destination of British equipment are unavailable from (*Continued on page 232*)

AIRWORTHINESS REQUIREMENTS FOR CERTIFICATE FOR EXPORT

By Gilbert Budwig

Director of Aeronautic Regulations
Department of Commerce

IN order to be eligible for domestic commercial license and for Certificate for Export, all aircraft produced in the United States must meet definite requirements as to airworthiness. For the purpose of clarity, these airworthiness requirements may be divided into two general phases which are as follows:

Compliance with the technical requirements concerning strength of materials and load factors to be substantiated by complete drawings and stress analysis submitted to the Department of Commerce; and

Compliance with the requirements regarding flight characteristics, including stability, maneuverability and performance, substantiated by actual flight testing of the airplane.

An elaboration of and a discussion concerning the two foregoing phases of the Department of Commerce requirements follows.

When an aircraft manufacturer in the United States desires to manufacture an airpalne for commercial operation, he makes application for an Approved Type Certificate which, if issued, makes all planes built in exact accordance with the Approved Type Certificate eligible for commercial license.

In order to obtain this Approved Type Certificate, the manufacturer submits a complete set of drawings of the airplane in question, together with a stress analysis and all other pertinent data. In order to represent the structure satisfactorily, the data submitted must include—

(a) A three-view drawing sufficiently well dimensioned to show clearly the general specifications of the airplane, including span, length, height, propeller clearance, propeller diameter, wheel tread, wheel and tire size, wing chord, wing gap, stagger, dimensions of wing, tail and aileron surfaces, location of doors and windows, etc.

(b) A general assembly drawing of each wing, with the sizes and locations of space, drag struts, drag wires, leading edge, trailing edge, ailerons, and members supporting the ailerons and controls clearly shown. Drawings of ribs, showing method of attachment to the spars and leading and trailing edges. Drawings of the fittings used in the lift and drag trusses and of aileron hinges made on a scale sufficiently large to allow dimensions and details to be clearly shown. Line diagrams of the external wing bracing showing truss dimensions and sizes of struts and wires.

(c) Lay-out of fuselage or boat-hull structure showing sizes and joints of all members of the primary structure. Drawings showing the method of attaching the wings, cabane structure, engine mount, chassis, tail surfaces, and tail skid in detail.

(d) Drawings of the tail surfaces showing spars, torque tubes, internal and external braces, fittings, hinges and masts.

(e) Chassis drawings, including a lay-out of the landing gear that shows size of struts, axle, bracing wires, shock-absorber details, spreader tubes and other important members and the method of connecting them. Drawings of the tail skid, showing the skid, its connection to the main fuselage structure, its shock-absorbing mechanism, and the method of steering it, if any.

(f) Control system drawings showing the method of operating the control surfaces and the constructional details of the system. Detail drawings of the mechanisms used to adjust the stabilizer, fin, wing flaps, or similar surfaces.

(g) Drawings of the powerplant installation showing fuel and oil tanks and piping, throttle-control system, fire wall, exhaust system, and cowling. If the manufacturer desires, adequate photographs may be substituted for drawings of the piping, cowling and exhaust system.

(h) For seaplanes, drawings of the floats showing their lines, detail construction and general dimensions, and a lay-out showing sizes of struts and wires and means of attachment to the fuselage.

(i) A balance diagram showing the location of the center of gravity of the component parts of the airplane and its useful load, together with a table showing the weights of these items and the computations involved in determining the composite center of gravity of the fully loaded airplane.

(j) The material used in each of the members of the primary structure, including fittings, shall be clearly indicated by specification number on the drawings. If heat-treated materials are used, the ultimate tensile strength and other means of positive identification shall be shown for each member.

In addition to the foregoing drawings a complete stress analysis covering an investigation of the strength of the primary members of the wings, fuselage, landing gear, ribs, control surfaces, engine mount and/or nacelles, control system and all fittings connecting parts of the primary structure must be submitted substantiating the fact that these strength factors meet the conditions and load factors specified by the Department of Commerce. Also analysis must cover an investigation of all secondary members carrying heavy loads and the effects of these loads on main members. The stress analysis shall state by specification number the material used for each member or group of members, specifying whether or not they are heat-treated and what physical properties are guaranteed by the manufacturer. For metal members of special design, test data showing their strength properties must be submitted to substantiate the values used.

The technical data thus submitted are subjected to a minute and detailed investigation by the Engineering Section of the Department of Commerce. If the data are approved, an authorization is issued to the Inspection Service of the Department of Commerce requesting that a flight test be conducted on an airplane of the subject model.

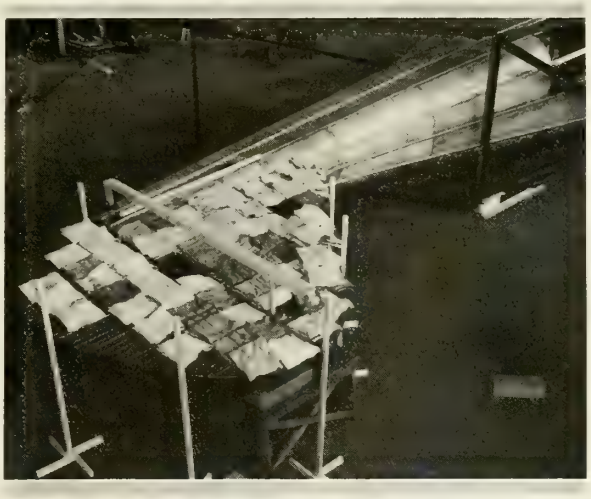
This brings us to the second phase of the procedure in obtaining an Approved Type Certificate, namely that of flight testing the airplane for approval of its flight characteristics.

An Engineer Inspector who is a practical aeronautical engineer and an expert test pilot is assigned by the Inspection Service to conduct an engineering inspection and flight test.

Static tests of the principal component members, including a standard rib, the control surfaces, the control system, and drop test of the landing gear and tail skid or wheel are conducted at this time. Additional static tests of other members are conducted when the Engineering Section considers such tests advisable.

A thorough ground inspection is then conducted by this inspector to determine whether the airplane as submitted conforms to the design and specifications approved, as well as to ascertain whether the workmanship, assembly and installation of the various components are in accordance with the airworthiness requirements.

If the results of the ground inspection are satisfactory, the inspector proceeds with the flight test. The airworthiness requirements state that all airplanes must be longitudinally, laterally and directionally stable under all power and load conditions. They shall, of course, be balanced. The flight tests as conducted by the Engineering Inspector consist of testing the airplane for balance, stability and controllability. The first tests are conducted under light load condition, first with the most forward center of gravity location, second with the most rearward center of gravity location. If the characteristics of the airplane are satisfactory under these conditions, the airplane is tested with full load. All these tests are conducted at various power conditions — that is, full power, cruising speed and power off. In addition, the airplane is tested with full load to determine whether its performance meets the Department of Commerce requirements concerning take-off, rate of climb, maneuverability and landing speed.



Static load test on the vertical tail surface of Douglas Dolphin

If the results of all these tests are satisfactory, the airplane may be issued an Approved Type Certificate, after which planes built in exact accordance with this design are eligible for commercial license as well as for Certificate of Airworthiness for Export.

With reference to the strength requirements and load factors required by the Department of Commerce, for normal conditions the requirements for commercial aircraft are in most respects equal to, and in some instances higher than, those of other countries. It is believed that the results obtained are entirely satisfactory, primarily due to the effectiveness of the thorough investigation of both the technical data and the practical inspection and flight test. This is evidenced by the rareness of accidents in commercially licensed aircraft, as a result of structural failures. In the few instances where structural failures have occurred, the coördination between our Accident Board and the Engineering Section has enabled the Department to check back immediately and correct the condition at the source by contacting the factory and having the manufacturer remedy the cause.

The Department is confident that an Airworthiness Certificate for Export, based on an Approved Type Certificate issued by this Department, is conclusive evidence of the airworthiness of the particular aircraft for the type of operation for which it was designed.

AIRCRAFT EXPORT SALESMANSHIP

(*Continued from page* 35)

or lose in prestige in a given territory commensurately with the service it renders its purchaser. This is particularly true in the case of airplanes entering a new market because of the general public interest in this latest means of transportation and the wide publicity it receives. A good airplane poorly serviced may be condemned as of inferior quality. On the other hand, an inferior airplane properly serviced may establish an excellent reputation for itself. Herein lies the importance of personal contact in the selection of distributors.

It is the better part of wisdom for an airplane manufacturer not to offer his product in a territory where no servicing facilities are available if he would avoid the risk of jeopardizing the reputation of his product and close the door to possible future business there.

Some short-sighted manufacturers, inexperienced in foreign trade, in their anxiety to move their stocks, have in some cases sold airplanes wholly unsuited for the territory in which they were to be used. Such methods are suicidal.

The follow-up is perhaps the greatest builder of goodwill. The manufacturer should not leave it to the distributor to follow up the customer after the sale, regardless of how reliable the distributor may be. By following up the customer directly, in his native language, the manufacturer will have:

(1) the assurance that the airplane is giving the purchaser the services expected of it;

(2) the assurance that proper servicing facilities are available to the purchaser;

(3) first-hand information to guide the manufacturer in improving current models and developing new models; and

(4) a check on the distributor.

The manufacturer interested in keeping his factory in operation twelve months in the year might well start analyzing Latin America as an outlet for his product now.

WAY DOWN SOUTH

By Don Rose

IN these dizzy days the news of the world beats upon the man who knows how to read until he is in some danger of losing his sense of distance, direction and proportion. The front page of his morning newspaper gathers the gossip of half a dozen continents to his breakfast table. It tells him what his next-door neighbors are doing and what is happening on the other side of the world. It allows headlines to the hold-up of a cigar store and also to an earthquake in New Zealand. It grants space to the platitudes of half-pint politicians and also to the documents of international diplomacy. The newspaper of today, indeed, is a seven-ring circus set in type, a cafeteria of quick lunches for every appetite, a talking picture of today as it might be made by a committee chosen from among the builders of the Tower of Babel.

To sit calmly in the middle of so much news from so many corners of the world without some sort of anchor is about as easy as to go fishing in the whirlpool of Niagara. But most of us steer some sort of a course through our newspaper, missing entirely those things that do not concern, interest or amuse us, and picking and choosing the others that do. Thereby we usually get a biased and prejudiced picture of current affairs, which is not a great deal better than absolute ignorance. Sometimes, indeed, it's worse.

It is an interesting, exciting and amusing world in which we live. But if we accept it as the average audience accepts the entertainment of a motion picture show, we shall get no great good out of it and make no real contribution to its progress. We shall be about as useful to civilization as the spectators at a flying field are to the advancement of aviation.

Behind the news of the day lies the real drama of human ambition and achievement and the accidents that befall them both. It is worth while to dig for it. As we do so we discover that news is nothing but a symptom of matters much more important, as the pimple on the young person's nose is a sign of spring. And even a little straw is enough to show how the wind blows.

Only now and then does a scrap of news come out of South America and land on the front pages of northern newspapers. The average reader sees it, swallows it whole, and hurries on to the baseball gossip from the spring training camps. He may do so, though in other respects he is a shrewd and capable man of business and supposed to be able to look after himself. He may even do so if he is interested in one way or another in aviation as a business, industry or investment. And yet he should stop, look and listen to every word that comes from the great continent to the South of us, and consider it more carefully than he studies the stock market reports and the weather forecasts. For nothing is quite so important to the business man in aeronautics today as the way the cat is going to jump beyond the Rio Grande and on the other side of the well-known equator.

This intelligent audience does not need to be told that South America is a considerable continent, only a little smaller than its northern neighbor. Its population is supposed to be in the same proportion, though the census is not taken very carefully in the jungles and other curious places that are to be found there. Possibly it is more important that it is the least crowded of all the world's great spaces except Australia, with the difference that it could easily support several times as many as are settled there now.

It is sometimes overlooked by those who think they know their geography that South America is also immensely wealthy in natural resources, and that so far these have only been developed to a fraction of their possibilities. It is a surprise to most North Americans to discover that the third largest city in the Western Hemisphere is not Philadelphia, but Buenos Aires, and that the most beautiful city is probably not Washington, but Rio de Janiero, which—by the way—has also a population of more than two million. It is a shock to most of those who have survived a honeymoon to find out that Iguassu Falls in Brazil are forty-three feet higher than Niagara, and a blow to our Northern patriotism to learn that the biggest mountain in the Western World is not McKinley in Alaska, but Aconcagua in Chile-Argentina. In South America there are, in fact, fifteen mountains that could look down on the highest peak on this side of the equator.

It is a magnificent land that lies beyond the Panama Canal—a land of splendid scenery of every sort and fashion, a land of every conceivable climate, a land of immeasurable resources. For many reasons, moreover, it is the world's greatest land of opportunity for the impending future. Civilization has moved westward around the world until it is nearly back where it began, but so far it has done not much more than skirt the shores of South America. But there are signs and portents that the compass of progress is pointing now to the Southern Cross and that history is bound to repeat itself beyond the equator in the conquest of a continent for the use and service of mankind.

This was vaguely suspected some time ago, even by the business men of America who were so busy making customers of their own immediate neighbors. It was during the Great War that we woke up, more or less, to the fact that a first-class market was awaiting attention on this side of the Atlantic and Pacific. Something was done at the time to develop and cultivate it. Ship-loads of big business men sailed South to drum up business, partly because our European customers were buying very little but the weapons and munitions of war, and partly because our international competitors had other matters on their minds. A good deal was said in criticism of our former methods of doing business with South America. High school students were advised to learn Spanish, and exporters were warned to quit using Latin America as a dumping ground for inferior products. We discovered, indeed, that our reputation down South was not much better than that of a bootlegger in a Baptist seminary. And we found out that the Englishman and the German were considered comparatively respectable, and that Europe was entrenched by investment, experience and tradition in a territory where we should have a natural advantage.

We used to say that we got nothing out of the war, but we must admit that we picked up a nice piece of business with Latin America. Our exports in that direction in 1914

were about $282,000,000; in 1917 they were twice as much, and in 1920 they were four times as much. In 1921 we broke all records with an export total to Latin America of $1,313,044,103, which was about twenty-one per cent of our entire foreign trade. And that was about eleven times as much stuff as we sold to our Southern neighbors in the year 1900.

The next year we fell rather forcibly off the band wagon. Export business dropped to about $507,000,000. But since then it has been climbing fairly steadily. Since 1917, about seventeen per cent of our exports have gone to Latin America. Even last year, which was a rather sour one for business of all sorts, we sold the Southerners nearly $800,000,000 worth of goods.

Unfortunately for our favorite industry, aviation figured rather badly in this total. Our entire aeronautical exports last year, indeed, were only about one per cent of our total trade with Latin America, and a big slice of this one per cent went to Germany and China. We sell our neighbors a lot of stuff, but we don't sell them very many airplanes, engines or aeronautical accessories. We don't sell them nearly as many as we should.

South America is a land of magnificent distances and seriously inadequate transportation. Railroads there are short and scarce, roads are splendid in the cities and hopeless in the hills and rural territories. One airplane service on regular schedule is able to cover in a few hours a journey which can only be made by road and river in ten days to two weeks. It is, indeed, the promised land for the aircraft manufacturer. And it is time to wake up to the fact that our competitors know it.

You may have heard of the depression. It is talked about a good deal, in Congress and elsewhere, and blamed for everything from the Treasury deficit to the weather. Business men are blaming it for the comatose condition of their cash registers, and farmers are holding it responsible for the wheat surplus and the price of eggs. It is a fashionable scapegoat, indeed, for anything that happens to be wrong at the moment, which is usually plenty.

But this depression is not a private affair between the American citizen and his conscience as he enters a deficit on his income tax declaration. It is spread all over the earth like a convincing case of measles on a fat baby. In case you don't think so, consider the fact that traffic through the two main arteries of the world's business by sea—the Suez and Panama canals—fell off respectively about twenty and thirteen per cent in 1930 as compared with 1929, and that England's idle shipping increased by about 300 per cent during the same period. Hundreds of English ships which should have been collecting cargoes and dividends were collecting rust and barnacles instead in the British harbors.

It is no secret that Great Britain's economic anxieties are much more serious than ours. Taxation is higher, unemployment is worse, business is more badly hurt by the collapse of markets in the far places of the earth. John Bull, in fact, is in a tight place. But with characteristic courage and determination he is endeavoring to do something about it. He isn't cursed with a Congress like ours, whose ambition seems to be to spend money and let somebody else figure out where it is to come from, and therefore his efforts toward the recovery of world trade are not so well advertised as some that are proposed in Washington. But he's working at it, just the same.

I commend to your attention the activities of His Royal Highness Prince Edward Albert Christian George Andrew Patrick David, Prince of Wales and super-salesman for the British Empire. From what we read in the papers it might be supposed that the gentleman does nothing for a

(*Continued on page* 229)



Courtesy of Pan American Airways

It is a surprise to most North Americans to discover that probably the most beautiful city in this hemisphere is Rio de Janeiro

WHAT OF THE GIANT AIRPLANE?

By Ernest Jones

INCREASE in the size of airplanes for added carrying capacity, comfort and economy seems natural enough. In all other modes of transportation—ships, railroads, buses—the tendency has always been toward greater size.

From earliest record, peoples have had the urge to travel. And with so-called progress in bulk transportation there has ever come greater size, greater speed and greater luxury. When we get up to the modern extra-fare train with its alleged conveniences—if we are to admit barbers, maids, showers, secretaries, waiters, et cetera, as attributes of progress—we note that the cars have gotten bigger and the space per passenger has grown immensely.

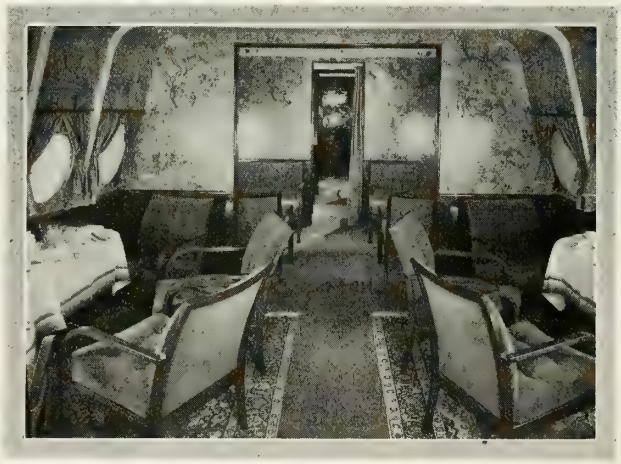
Competition among trans-oceanic vessels has brought about a still greater bulk, with ever more and more space per passenger—needless to enumerate the popularly conceived luxuries of such means of travel. Whether strictly economical or not in horsepower per passenger, tonnage per passenger or space per passenger, we have what we have and call it "progress."

According to the last data immediately available, the *Leviathan's* income from passengers was six times that from any other source, so we may expect, if steamship travel is any basis, that the air transport business must look to personal as well as materials travel. And, based on all manner of transportation, the traveling man and woman wants all the luxury he can pay for, whether in the air or on the land or sea.



THE DORNIER DO.X

IS she not a forerunner of the future? To see in the sky this ship of fifty tons is to sense the approach of a new air age. A new epoch of marvellous realities inscribes itself upon the calendar of time. Progress? Without doubt yes! The air follows the same route as its predecessor, the sea. The same laws prevail—always larger, always faster craft. Our ocean vessels of tens of thousands of horsepower have as ancestors the sailing ships of wood. Thus moves air navigation! ("Les Ailes" magazine.)



Comfortable accommodations on the Dornier Do. X

There must be room to move about. Sleeping accommodations must be provided, for the prospect for airplane speeds is such as to keep the railroad in competition with the air for yet some time, unless the night hours are flown. Meals, hot and served on tables. Lounges and other facilities.

The comparatively small plane now in general use on the airlines can by no stretch of the imagination offer anything like luxury, compared with the standards provided by other forms of transportation. And as for wholesale goods transport, there is also much to be desired.

That passenger mileage today is not what it might be is no argument against providing greater incentive. The railroad came first and the passengers after.

Of course, there will be a limit to size, some day, either economic or structural. There was no prophecy for the automobile to which we could turn, nor is any one likely to vouchsafe the future of the commercial airplane. But what do the wise men say?

"Give us a payload of at least five tons," says R. E. M. Cowie, president, American Railway Express. "More and more large 'ships' of these kinds (like the Dornier) will be built," thinks Harvey L. Williams, president of Air Investors. "Every sign points to larger craft," is the opinion stated by Reginald M. Cleveland in the New York *Times*, while an editorial in the same paper argues "one sure conclusion to be drawn is that profit in passenger services will be possible only by employing big 'ships.' It may be safely predicted that before many years we shall look back upon the F-32 as a small plane." "Airliners . . . carrying fifty to a hundred tons" is the vision expressed by Edward S. Evans, president of Detroit Aircraft Corporation. "There is no definite limit to size," says L. C. Milburn, vice president of the Glenn L. Martin Co., and H. A. Gassner, chief engineer of the Fokker company, feels the "design of very large planes seems to be more an economic and financial problem than one of engineering." Speaking of the Dor-



Looking forward in the cabin of the American Burnelli



The Keystone-Loening Patrician, among the largest and most luxurious American trimotored passenger monoplanes

nier Do.X, Louis Bréguet is quoted as saying that "this effort at the construction of a huge flying ship . . . showed that the Germans were realizing results which no other nation could boast." And there is much more by way of authoritative opinion.

Der Tag

Perhaps the day of the giant is not so far off. If the investor will sacrifice today's expected dollar dividend (which he doesn't always get) for a more certain two-dollar dividend day after tomorrow we shall make headway.

Right here one might remind himself again that the airplane, the machine gun, the submarine and many another American invention were forced abroad for development funds. And the giant airplane seems also to have received its furthest promotion among our brethren across the sea.

Of course, the mere idea of better and bigger aircraft is not new, even in America. We might hark back to the Curtiss *America* built for trans-oceanic flight in 1914. Then there is the German war series of eighty-five giant airplanes, some weighing up to sixteen tons, with multiple engines, clutches and geared controllable pitch screws; and the Italian Capronis. In the post-war period we recall the Navy's N.C. flying boats and the foreign series leading up to the Dornier Do.X; and we note the moment's Caproni, Farman, Latécoère and Junkers.

We must look, too, to the possible users of these Brobdignags of the air. There is the normal urge of the present generation to travel, but continually generations reproduce themselves and it is going to be difficult to keep the new one out of the air. Admittedly, the hop from buggy speed to the twenty miles of the early automobile was but a slight spurt when compared with the jump from automobile to airplane, with another dimension to think about, but we have faith in youth. The wiseacres threatened the early railroad train with jumping off the track and other startling adventures, but nothing happened.

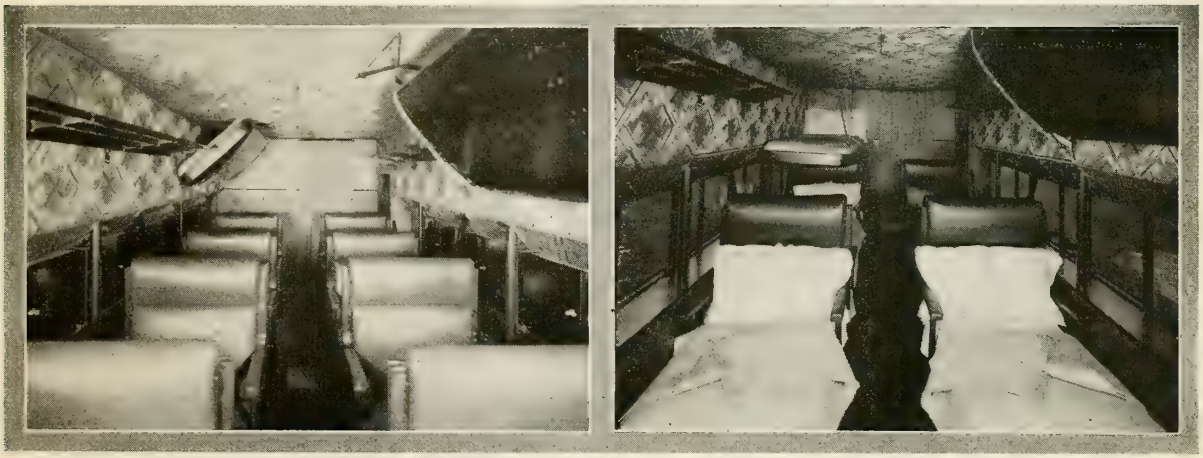
Just as much vision is required for the advancement of commercial aviation as was exercised by the pioneers who bridged the rivers and tunneled the mountains and waited for the breeding of traffic on the transcontinental railroads. We must not stick too closely to the theory of "it can't be done."

That Weight Ratio Law

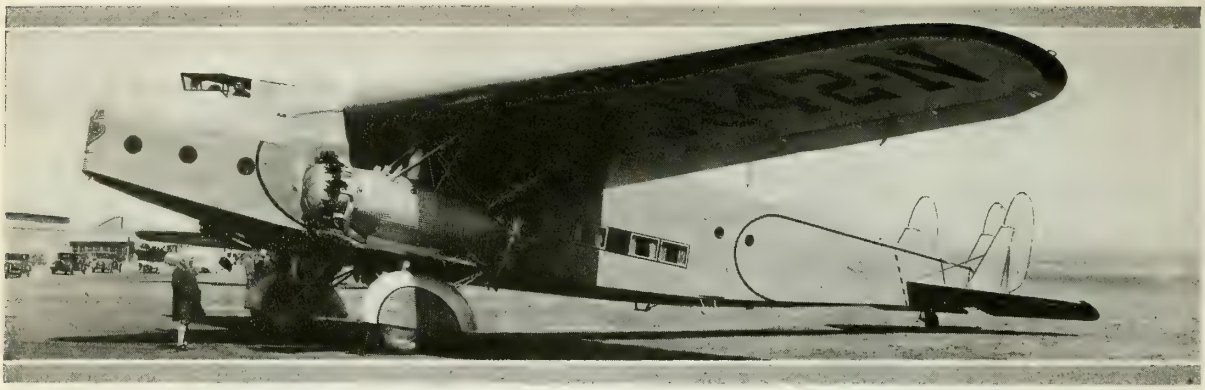
The Newcombs and Melvilles of today point to the law about structural weight increasing so much faster than useful load that a real giant is out of practical consideration. There is some such law—but, like prohibition, it may not always work.

Picking a few American airplanes in the two-ton or more class, the rise of the useful load percentage in craft applicable for commercial use stops at about the fifty figure—and, apparently, that's no mean percentage, either. However, that particular job weighs less than 5,000 pounds. The moment this gross weight doubles, the useful load percentage takes a decided drop in accordance with the law.

But the Germans, Italians and French point to a number of planes (much bigger than any existing American job), the useful load percentages of which run from fifty on up to sixty and beyond. Perhaps there's an error in the figures, or perhaps—but certainly, no one would want to



Keystone-Loening Patrician interior, showing well-upholstered chairs converted to sleeping berths as in a railroad Pullman car



Anthony Fokker standing below one of his latest four-motored Type F-32 passenger airliners

mislead us. The Do. X, greatest yet in the air, is said to have a figure of merit of 55.5. The Caproni, with an alleged useful load percentage of 66.6 has just recently established a few new world records.

According to the table of useful load percentages of American and foreign planes, the aforesaid law seems at least occasionally to be held in abeyance. Even admitting any inaccuracy in the weights and percentages, as gathered from the periodicals, there seems to be something in the theory that the giant plane is practical from an engineering point of view. On the basis of figures, the larger the plane the greater the useful load percentage! If facts prove this, what becomes of the weight-ratio law?

That this law is in abeyance would seem to be borne out by the story of the scales in the case of the Dornier and Caproni, not to mention a couple more which have not been flying as yet—publicly at least!

Some show may be made to the effect that the giant airplane is economically impractical if not impracticable, but the proof of the pudding will be in the eating.

What if the useful load percentage be relatively less than that of the smaller craft, admitting the law is at work, if one giant vehicle can take the entire daily volume of New York's first class mail for Chicago at one bite?



A lounge and sleeper compartment in the Fokker F-32

There is the theory, too, that a lot of small planes, leaving at short intervals will perform a greater service than one monster leaving less frequently; but who is there to say that there won't be enough business, with passengers, goods and ordinary mail, to warrant frequent departures of the giant?

There is some talk that a fleet of small planes will operate more economically than one large equivalent.

Those "Ten Small Planes"

Pound for pound of structure, ten small planes might cost only the same as one large plane of equivalent payload—speaking of payloads for the moment. The giant, however, can carry light and bulky goods which would otherwise fail of air transport advantage; as the size of the airplane increases more bulk space rapidly becomes available beyond any mere horsepower ratio. Thus, the giant plane has added attractions for the acquirement of goods traffic.

Radio and other instrument equipment would actually add to the investment in the ten small planes by just about ten times. Pilot and radio operators' expense would obviously cost more for the ten-plane operation than for the one-plane, and the flying payroll is no small item.

In comparison with present-day small transport planes with radial outboard engines, the giant with its large geared screws and housed powerplant may be argued into a saving of fuel and oil. It may be shown to be safer than the multiple-unit idea.

Depreciation of engines, in dollars, may be figured less for the giant than for its ten small equivalents.

What the Giant Will Look Like

It does not seem reasonable at this time to throw entirely into the discard the idea of the great air carrier. We must, it may be argued, make preparation for the leviathan of the air.

What will it look like? What the motive power? What of innumerable other aspects? There is considerable weight of argument in favor of the cantilever monoplane. Jean Fradiss, structural engineer of the Fokker works, argues that the monoplane type of construction has "decidedly won the battle against the multiplane. . . . The actual thick wings . . . have as good aerodynamic characteristics as thin wings and are far more efficient, and the future thick wings will be even better as the airfoil design

is perfected." And there is plenty more of such evidence. It looks like the "flying wing" with everything inside except the air screws. However thick the wing, the adherents of progress do not admit that the monoplane is the last word. The thick, load-carrying wing may be employed in both monoplanes and multiplanes. The whole appearance of the plane may yet change considerably, for the "tail-first" idea has been injecting itself from the time of the Wrights. Some may revive the tandem type, who knows?

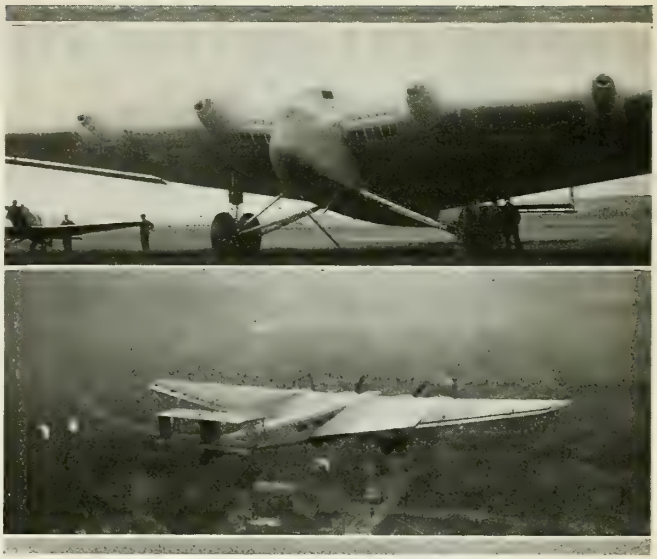
Whatever appearance the external form may take, there is something doing in the way of powerplants.

The Giant's Powerplant

One may well raise the question as to the number and power of engines. There is argument for safety in numbers, separate or geared. There is also argument that, if an engine is reliable, there is no need to multiply the units save to attain increased power, and that suggests increase in the horsepower of single units. Imagine the more than 7,000 horsepower of the Dornier in but one or two units!

The guess may be hazarded that the number of power units will decrease. "Powerplants have always held, and will undoubtedly continue to hold, the key to aviation progress. As airplanes increase in size, the problem of satisfactory powerplant installation becomes more serious. Looking forward to the really large commercial craft of, say, 100-passenger capacity, one is struck with the obvious conclusion that the powerplant solution is not to be reached by mere multiplication of engine units of sizes now available. Certainly, the hanging of engines all over a large airplane is assuredly most undesirable from the standpoint of control and accessibility," says Grover C. Loening, president of the Loening Aeronautical Corporation.

At the present stage of gasoline engine practice, there are no large single units available and one must turn to some method of combining comparatively low-powered units. "The most elegant solution of the engine problem is to house all the powerplants in the wing itself and to have them geared in groups to shafts which have large propellers located at some distance from the engine room," according to C. T. Porter, chief engineer of the Keystone corporation. This is just what the Germans successfully did during the war. Many others join in the argument for multiple engines, centralized powerplants, the flying wing, great air screws at slow speed and accessibility of powerplants.

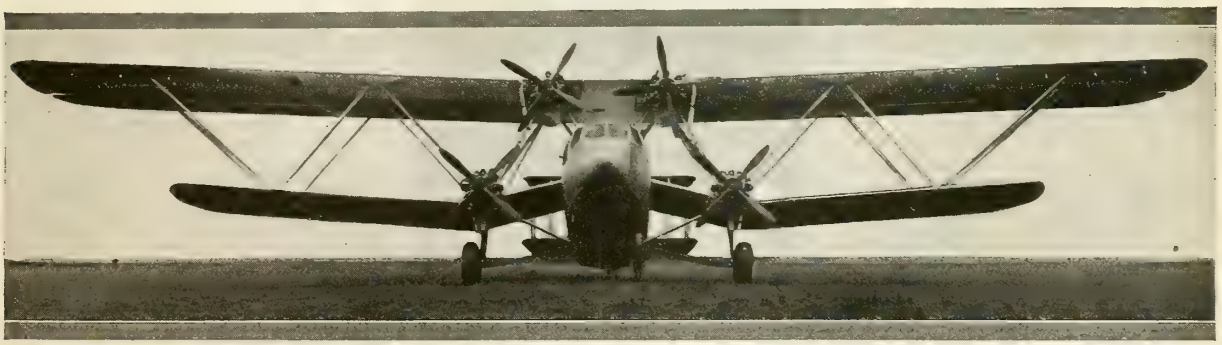


Germany's largest land airplane, the Junkers G.38

What is likely to happen to the radial engine appears obvious. There is no little evidence, expressed by radial engine builders themselves, to the effect that the liquid-cooled engine has the advantage when it comes to inside placement and gearing. For such engines in giant planes there is argued fewer failures, less maintenance trouble, greater reliability, more ready adaptation of mufflers and arrangements for diminishing of noise, greater susceptibility to the use of reduction gears, better performance and accessibility, longer life and greater resultant economy.

Large diameter, slow speed air screws have been noted for their efficiency from the beginning of aeronautics, but the added weight of gearing and their increased diameter have made them inapplicable to the small machine. It is claimed, rightfully, that with slow speed propellers the noise from this source will be eliminated. Improvement in airplane performance is at once noticeable, particularly in take-off and climb. Speed is also improved, as is also the ability to fly on less power than the total available. It is claimed, also, that a twelve-cylinder or eighteen-cylinder engine has that perfect balance which means so much when compared with the alleged vibration tendencies of the radial engine. There are still other arguments which may be cited.

Service flown screws capable of pitch adjustment in flight are available, and (*Continued on page 226*)



The newest Handley Page airplane to be used for long-distance passenger service by Imperial Airways

The PILOT and his AIRCRAFT COMPASS

By

Lt. Logan C. Ramsey, U.S.N.

Author of "The Navigation of Aircraft"; Instructor in Aerial Navigation, Naval Air Station, Pensacola, Florida

THE aircraft compass, in certain respects, is the most important instrument the pilot has on his instrument panel. In the final analysis, it is the most dependable guide to the pilot in directing his course from place to place. If properly installed and compensated, the aircraft compass may be relied upon to guide the pilot safely to his destination under conditions that would render such an achievement a very difficult one by other methods.

Despite this fact, pilots as a class fail to make the best use of this instrument. Railroads, rivers, transmission lines and other clearly visible guides upon the ground interconnect practically all of the more important airports of the United States. Hence it is possible for one of our pilots to fly for years without using his compass at all. But sooner or later all pilots become involved in situations where their ultimate chance of safety depends upon their ability to fly by compass.

These cases may be divided into two groups, according to the weather conditions obtaining. The first type includes those situations in which the pilot starts out with good flying weather and later runs into such thick weather that all means of visual reference exterior to the plane are lacking and the pilot must resort to instrument or, as some persist in calling it, "blind" flying. Facing these conditions, a pilot lacking experience in steering a steady heading by compass is in grave danger. The best he can hope for is a Mexican stand-off—saving his life but losing his plane. If, however, the pilot is experienced in the use of his compass, he stands a chance of bringing his plane through safely. It is true that the use of such other instruments as the turn indicator, air speed meter and altimeter is involved in such situations. Nevertheless, the primary requisite for instrument or "blind" flying is the ability to maintain the nose of the plane in a steady direction by means of the compass. Much has been written about instrument flying, and a general discussion of this subject is not pertinent to this series of articles, yet there are three situations in instrument flying in which the aircraft compass figures that merit mention here.

The first of these is that in which the pilot, flying entirely by instruments, finds it necessary to proceed upon a northerly course. Here, as long as the pilot is careful to maintain his wings level laterally by use of the bank indicator, he will experience no great difficulty, though his course over the ground may be more sinuous than when he proceeds upon other headings. But if the wings become tilted through inattention or bumpy air, the compass may indicate a change of direction when none has been made. Or, if a turn is started, the compass may indicate a change of heading opposite in direction to the actual. This characteristic of the compass is known as the northerly turning error and arises from the vertical component of the earth's magnetic field. The direction of this field is not parallel with the surface of the earth. Now the cards of the aircraft compass are designed to operate while parallel to the surface. Hence it is necessary that the only component of the earth's magnetic field which exerts a directive influence upon the card be that parallel to the ground. The effect of this vertical component or dip is usually counteracted by attaching a small mass to the southern side of the compass card just sufficient to balance the downward pull of the dip on the northern side of the card. If, while the aircraft is proceeding in a northerly direction, the wings become tilted or if a turn is started, acceleration and gravity acting upon the unbalanced mass of the card incline it to the horizontal. There will then be a component of the dip acting in the new plane of the card and the total directive force influencing the compass will be the resultant of this component and the horizontal component of the earth's magnetic field. Under these conditions the compass card may turn faster than the aircraft and thus appear to indicate a turn in a direction opposite to the actual. If the turn is continued or if no turn has been commenced and the wings are brought back to the horizontal, the compass will eventually return to normal. But during the interim the indications of the turn indicator should be accepted as true rather than those of the compass.

The other two cases previously mentioned involve quick turns from easterly and westerly courses. If a sharp turn is made to the right away from the east, or if a similar turn is made to the left away from the west, the effect of acceleration and of the dip acting on the inclined plane of the compass card will oppose the normal directive force of the horizontal magnetic component and the card may spin around completely. Sharp turns in the opposite directions—that is, to the right away from the west, and to the left away from the east—will not be accompanied by this misbehavior on the part of the compass; for such turns the compass will only exaggerate the amount of the turn. However, in all cases where instrument or "blind" flying is necessary, pilots should make all turns as gradually and with as little bank as possible in order to prevent any erratic behavior on the part of the compass.



Avigo compass with new type spring cord suspension to overcome vibration effects

In those cases in which the weather presents lowered visibility conditions but permits the pilot to see the surface, the compass is no less valuable. Under such circumstances the usual major landmarks may be invisible but the

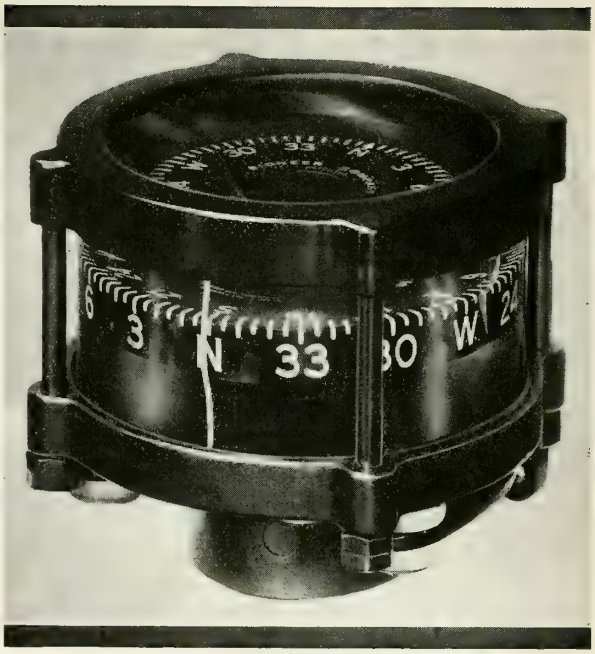
minor ones presented in such an unfamiliar aspect as to be unrecognizable. Consequently, the mere fact that a pilot has flown a particular route many times is no insurance against such a situation. I was once flying as a passenger with an experienced pilot who had flown the route between Washington and Norfolk many times. The weather was fairly thick. The pilot flew down the Potomac and then started gaily up the Rappahannock River under the impression he was proceeding down Chesapeake Bay. He did not discover his error until his attention was called to the fact that the compass indicated a northwesterly instead of a southerly heading.

On another occasion, several years ago, a plane came in to Mitchel Field about an hour overdue from Washington. The pilot's story was as follows: "After I crossed the Delaware I ran into thick weather. For quite a while I could not see the ground. Then I picked up and began following what I thought was an oiled road. I could see it only faintly as a dark streak on the surface. I didn't see anything else and was getting a little worried when the weather cleared up a bit and I saw that I had been following a streak on the water. I then headed northwest by compass and finally hit Long Island about forty miles east of here."

Apparently he had crossed New Jersey and headed out across the Atlantic Ocean in the general direction of Europe! This pilot was lucky; another who disregarded his compass until he found himself engaged on an unpremeditated ocean flight might experience a forced landing and never be heard from again. Other similar instances might be related ad infinitum.

The point is that many pilots do not utilize their compasses to an extent dictated by ordinary prudence and common sense. This tendency, although deplorable, is quite natural. The demands upon the attention of the pilot flying cross-country are many; and where ground guides, particularly railroads, are available, the simplest although not always safest method is to follow them. In addition, there are several other contributory causes. Many pilots are unfamiliar with the theory of compass errors and, having noted that the heading by compass differs from the known true direction or course, feel that the compass indications are unreliable. Many of those who do understand these compass errors neglect to have their compasses compensated regularly and are thus uncertain as to the amount and direction of their compass deviations. And even those who desire to keep track of their compass errors often find it difficult to locate a turntable or compass rose upon which the magnetic directions are marked. How any airport can pose as a completely equipped aviation center without a compass rose for the compensation of compasses is a mystery, yet the majority of airports exist without this necessity. Facing such handicaps, pilots cannot be severely condemned for taking the "easiest way" and flying by landmarks.

Another factor tending to cause pilots to neglect their compasses is that steering a plane by compass requires a knack that is not acquired immediately. Aircraft compasses have certain definite periods of oscillations, and it is necessary for the pilot to anticipate, to a certain extent, these motions. Although no set rule can be stated, an experienced pilot should become expert in steering by compass after about five hours of diligent practice. The knack, once acquired, becomes almost as automatic as the manipulation of the controls, and the pilot is able to maintain a steady course by compass with little conscious effort. At any rate,



Magnetic compass produced by Pioneer Instrument Company

a good compass course can be steered without any appreciable diversion of the pilot's attention from the *keeping track of landmarks* and from the ever-present necessity of keeping in view the most promising spot immediately available for a landing in case of engine failure.

Aside from the interests of safety, the method of steering a course by compass has a strictly commercial value that can be measured in dollars and cents. Aviation is essentially a means of transportation in direct competition with other modes. In this commercial conflict the chief advantage accruing to aviation is its greater speed, derived chiefly by means of the inherently greater velocity of the vehicles employed but also from the greater directness of the routes available. If the pilot by poor navigation deviates from the direct route, he lessens the speed advantage enjoyed by aviation which, of course, militates to the detriment of the passenger or shipper and may result in the loss of their patronage. Considered from this viewpoint, the present-day pilot's situation may be considered analogous to that of the maritime captain in the early days of the last century. At the start of that period mariners were navigating by rule of thumb. Then new and more accurate methods of navigation were developed, and navigators using these methods regularly made voyages in quicker time than those who adhered to the older ways. In a very short space of time ship owners noted the difference in the dividends paid by their several vessels and began to discharge the laggards.

Now flying hours have a certain definite cost. Other factors being equal, the pilot who directs his course by compass, in addition to keeping track of his position by landmarks, will traverse a given route in quicker time than one who depends entirely upon landmarks. This difference in time was determined by experiment to be about two minutes per one hundred miles of travel. The experiment was made several years ago and was conducted incidentally to the flight checking of a map for aerial navigation. The round trip between the two terminals was made several

(*Continued on page 226*)

THE "M" WING SECTIONS

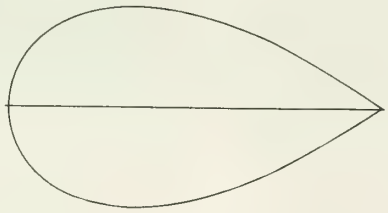
Article Ten on the Principles of Aerodynamics

By
Dr. Max M. Munk

THE "M" sections are mathematical wing sections proposed by the author of this article for obtaining better and more practical design results. They are of simple mathematical structure and adapt themselves easily to the general and universal wing section theory without involving numerical or graphical methods. Their mathematical equations give directly the average direction and the symmetric direction of their mean camber line.

A special series of "M" sections, originally intended as the first series in a large research program, has actually been submitted to laboratory tests which brought out their advantages. Two or three sections from this first series were readily adopted in practice, although the series was only intended as a preparation for more promising series. They contain "M" sections that can almost with certainty be predicted to surpass in efficiency the "M" sections so far measured.

The "M" sections do not possess special features inviting the computation of the theoretical and academical potential flow in numerical detail. Such potential flow exists with certainty for each wing section, but its computation is rather useless. Features inviting and facilitating such computation were gladly sacrificed to features promising better and more practical wing sections.



Thickness curve with straight mean camber line

Computations of the "M" sections were made by computing the distances of all its points from the chord of the mean camber line. These distances are obtained by adding not more than three partial distances, two making up the mean camber line, and the third, by addition and subtraction, the thickness. These sections can therefore be said to be the superposition of three curves—two plain curves giving, in combination with one another, the mean camber line, and one closed curve giving the thickness. These three curves are a common parabola, an "S" curve derived from a parabola, and the "thickness" curve, likewise closely related to the parabola.

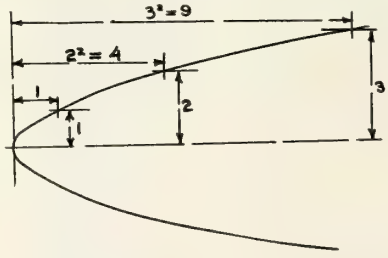
The simplest cases of the "M" sections are its thickness curves only, having in that case straight lines as mean camber lines. This straight line is then parallel to its average direction and to its symmetric direction, and the characteristic angle of the pure thickness curve is therefore zero. It follows that the pure thickness curves have a fixed center of pressure at 25 per cent of the chord—that is, halfway between the leading edge and the center of the section. The lift is proportional to the angle between the direction of the motion and the straight mean camber line.

This follows from the straightness of the mean camber line, and holds therefore for all strut sections, whether "M" sections or not. With "M" sections the shape is derived from a parabola with its open side turned towards the trailing edge. Such parabola is obtained by plotting the square roots upward and downward against the plain numbers to the right. It has then a round leading edge, to the left, which can be varied by "compressing" the parabola; that is, by changing the scale of plotting, or reducing the vertical distances in a constant ratio leaving the horizontal ones unchanged. Such a parabola has no trailing edge, however, but is open to the right and therefore by itself does not give a wing section.

A sharp trailing edge is obtained by reducing the vertical distances from the axis (called the chord) in a variable ratio proportional to the distance from the trailing edge. For instance, at the leading edge the vertical distance from the axis is not reduced at all; at the center it is reduced to one half; and at the trailing edge it is reduced to nothing. In this way, a sharp trailing edge is produced. The mathematical curve beyond the trailing edge is entirely disregarded for the present purpose.

This thickness curve of the "M" sections admits of one variation only—a uniform reduction of the local thickness along the entire chord. This leaves the maximum thickness always at the same point—at one-third of the chord.

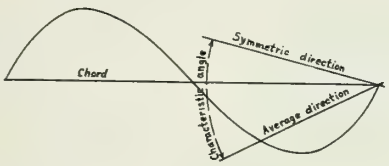
The thickness curve, by itself, is not an efficient wing section, but efficient wing sections can be built up from it by curving the axis properly. At 65 per cent of the chord the thickness is almost as great as at 15 per cent, except that it is five per cent smaller. These two thicknesses are 85½ per cent and 81½ per cent of the maximum thickness. The radius of curvature of the leading edge has a suitable magnitude too for the practical thicknesses. Its ratio to the maximum thickness depends on this thickness itself, as the radius of curvature changes with the square of the compression ratio.



The construction of a parabola

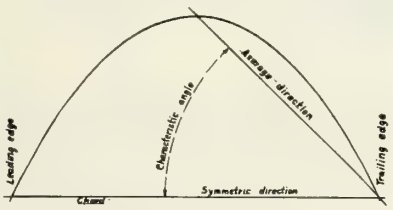
We proceed to the discussion of the two curves making up the mean camber line by superposition, each compressed in its individual scale. The first curve is a common parabola through the leading edge and the trailing edge. The open side is now directed down. This is a symmetric curve. The symmetrical direction is parallel to the chord, but the average direction is not. It is parallel to the straight line connecting the trailing edge with the apex in the center. The mean camber line, therefore, has a lift when moving parallel to the chord, and its absolute angle of attack is larger than the angle of attack of the chord. The characteristic angle is not zero, but a travel of the center of pressure takes place. The second curve provides for lack of symmetry of the mean camber line. This curve has a shape some-

what like a capital S, and is therefore called the S curve. The S curve is obtained from the parabola by reducing all vertical distances from the chord proportional to the distance of the point from the center. The front part is open to the bottom. At the center, the S curve intersects with the chord. The rear part is open to the top, and is antisymmetric to the front part. The angle between the chord and the tangent in center is twice as large as the angle between the chord and the symmetric direction and four times as large as the angle between the chord and the average direction. At the angle of attack zero of the chord, the symmetric direction has a positive angle of attack, and the average direction has a negative angle of attack. The characteristic angle is negative and the center of pressure travels from front to rear. This wing section camber line is stable.



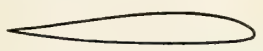
S-curve as the mean camber line

The combination of the parabola with the S curve, each reduced in an arbitrary and separate ratio, gives a man camber line, the characteristic angle of which can be chosen at will by superposing the positive characteristic angle of the parabola with the negative characteristic angle of the S curve in any desired ratio. In that way it is possible to obtain camber lines with the characteristic zero angle which are by no means symmetric nor straight, and still possess a fixed center of pressure. They are characterized by camber in front and a turned up tail to make up for it. In all, there are three variations possible with the "M" sections — thickness, camber and characteristic angle. The thickness represents the structural fitness; the camber is closely connected with the maximum lift; and the characteristic angle determines the travel of the center of pressure within the normal flying range.



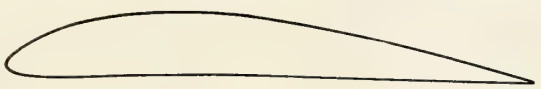
Parabola as the mean camber line

The tests so far made with "M" sections refer to small characteristic angles only. Such a manner of starting the research was thought promising, because the strut sections likewise with a small or zero characteristic angle, were known to have remarkably small drag, and it was hoped that "M" sections with a small characteristic angle would combine this small drag with a larger lift due to their larger curvature. This was what actually happened. The continuation of the "M" section research would now consist of carefully increasing the characteristic angle, so as further to increase the maximum lift without increasing the drag. The first series shows the way to proceed. This series was made in 1925, and it is six years ago that continuation of the research was postponed. But it is never too late, and better now than never.



"M" section with small travel of center of pressure

The different curves discussed and their shapes are illustrated by the accompanying figures. For those readers acquainted with analytical geometry, I am giving the analytic expressions for them. The distance along the chord of the mean camber line is denoted by x, so that the leading edge is $x = 1$ and the trailing edge $x = -1$. P, S and T are the vertical distances from the chord, and they must be multiplied by suitable reduction factors in order to obtain the different "M" sections.



One of the "M" sections with center of pressure travel

	Equation	Aver. Angle	Sym. Angle
Parabola	$P = 1 - x^2$	1	0
S. Curve	$S = (x^2 - 1)\, x$	$-\frac{1}{2}$	$\frac{1}{4}$
Thickness curve	$T = (1-x)\ \sqrt{1+x}$	0	0

The ordinates of the upper and lower camber lines of the "M" sections are $p\,P + s\,S + t\,T$, where p, s and t are arbitrary constant multipliers. The maximum of the parabola is p, the center inclination of the S curve is s. The maximum thickness of the thickness curve is .5443 t.

It is pertinent to close this discussion of the wing section theory with a remark on pressure distribution. The computation shows that with extremely thin wing sections there is about equal positive and negative pressure on top and bottom and opposite pressures on opposite points, so that the wing is half supported by suction on top and half by pressure under the bottom. A strut section, on the other hand, in the zero lift position, has suction almost all around it. The air is flowing around it, and its centrifugal forces in the curved path create this suction.

With wing sections with actual thickness, the pressure distribution of the mean camber line and of the thickness superpose. The suction of the thickness superposes on the even suction and pressure of the mean camber line, resulting in an excess of suction. Actual wing sections, with real thickness, have therefore more suction than pressure; they are more hanging in the air than resting on the air.

This fact has long been known from measurements, and has been misinterpreted. It has been mistaken for an important characteristic for the mechanism of creating the lift. It has, however, nothing to do with it, the excess pressure being caused by the thickness and not by the camber, and has therefore no direct connection with the lift production.

In these first ten articles of this series, we have discussed the theory of lift production, as well as wing sections developed by the trial and error method, and mathematical wing sections, concluding with the "M" sections. But our consideration of wing section flow, although it has indicated center of pressure travel correctly, has shown the lift only as a function of the effective angle of attack. Next, in order to be fully equipped to compute the lift, we must consider the actual angle of attack, and that, in turn, introduces the matter of induced drag, which will be the subject of our article in the May issue of AERO DIGEST.

(This is the tenth of a series of articles by Dr. Max M. Munk. *Copyright, 1931. All rights reserved by the author.)*

THE TREND OF THE TIMES

By

David Lawrence

UNDOUBTEDLY, the adjournment of Congress means much to business. For awhile, at least, there will be no new legislation and no new inquiries. In recent years, this has come to be an important phychooglical factor in determining the trend of business.

Perhaps the most immediate effect of an adjournment is the opportunity it gives to the executive branch of the government to carry out the plans embodied in legislation. The drafting of regulations is usually a sequel to the ending of Congress.

There is no doubt that everybody in the official group felt better when March fourth arrived. For the winter session has been one of the most hectic in years. There has been an undercurrent of apprehension about the economic situation and, looking back over it now, it seems remarkable that more bills were not passed for the expenditure of huge sums. The bonus legislation, which it was thought would be a disturbing factor, will not have the consequences predicted, because, as the industrial situation improves, the veterans are not likely to borrow as heavily as has been anticipated. Also, there is the added fact that many veterans will not wish to eliminate their future benefits by borrowing at this time.

But the cost of the veterans' legislation is not likely to exceed a half billion dollars at the outside and even if it runs to seven hundred millions the government can finance its notes during the next eighteen months without materially affecting the security markets.

There is a better feeling nowadays about the business outlook because business has been concentrating on ways and means of reducing expenses and at the same time cultivating intensively markets new and old. Confidence has returned to an appreciable extent and plans are being made with much more decisiveness now then three months ago. All this is contributing to the gradual recovery which has set in definitely.

The country may be impatient over the slowness with which the restoration process is developed, but there are plenty of reasons for the gradualness of any reconstruction era.

As the spring months approach, there is apt to be an increase in employment, particularly in agricultural regions. The principal effort in the next few months will be to regain trade in the foreign markets. It is beginning to be apparent now that until foreign countries are assisted there is little likelihood that they will purchase in any great quantities from the United States. We lost more than $1,200,000,000 worth of trade in 1930 that we had in 1929 and, while there are indications here and there of a slight pick-up, the bulk of this amount is not yet in sight. If we could get back a large part of that foreign trade item, we would be able to employ at least a million of the men now idle.

It is not easy for the average man to see a connection between the depression abroad and economic conditions in the United States, but the international viewpoint is becoming impressed upon business leaders more and more every day. Some important transactions in international finance may be expected during the course of the present year which undoubtedly will aid in developing the purchasing power of the foreign countries.

There is still at present writing a delay in the industrial financing machinery. The bond market was particularly retarded by the expectation of large government flotations due to the veterans' legislation. The refunding of war loans occupied the better part of March and it probably will not be until the middle of April before the financing and refunding of industrial securities will begin in earnest together with financing of established companies which may be desirous of merging or amalgamating with other units in the interest of efficiency. A considerable amount of financing is on the shelves waiting to be moved out to the investor.

Meanwhile, the developments in the steel industry have been heartening to the whole business world and, while the figures on the automobile production are far from satisfactory, they indicate that the automobile manufacturers can count upon a certain absorption of their cars from month to month and probably an increased consumption in the forthcoming summer.

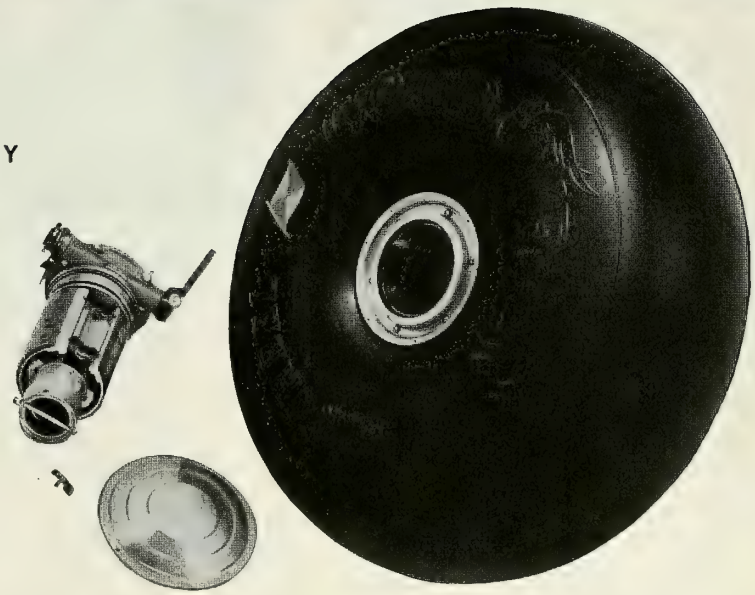
Much of the hesitation in buying has been due to the fear of loss of jobs. Many people who have not been certain of their own tenure naturally have hesitated to buy even necessities for fear they might need their funds for greater emergencies.

Perhaps the most important domestic development in the next few months will be the efforts to readjust the entire railroad problem. The Interstate Commerce Commission has authority to grant applications for mergers. This was undoubtedly held up because of possible Congressional interference, but now the Commission will have the full responsibility of making a start on the whole railroad problem. The railroads can be heavy purchasers of raw materials when they know the direction in which they are permitted to go. Until the consolidation tangles are solved, they are not likely to undertake any expansion.

With money rates continuing very low, the prospects are that sufficient funds will be available for any expansion which business may seek during the year 1931. This in itself is bound to be a vital factor in the economic recovery of the country. It is too much to say that the nation will be back on a normal basis by the beginning of 1932, but this much is certain—the process of recovery has been accelerated somewhat in the last few weeks and there is no doubt that 1932 will be a much better year than either 1931 or 1930. It probably will be several years before we will attain a twelvemonth period of the proportions of 1929, but most business men will be satisfied if they can again approximate 1928.

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GOODYEAR

EVERYTHING IN RUBBER FOR THE AIRPLANE

PERSONAIRLITIES



ALTHOUGH the town never suspected it, October 8, 1896, was a milestone in the history of Newtown, Long Island, for on that day it received its first, last and only claim to fame. On that October day it became the birthplace of William Henry McMullen! In years to come, air pilgrims from all over the world may possibly, or may not, journey to Newtown, L. I., eager for a glimpse of the first bit of earth upon which rested the inquiring gaze of the infant who later in life was to be known all over North and South America as Mac of Curtiss.

When Mac drew his first breath, the first gasoline motor cars were coughing dispiritedly, and horses were shying as the horseless carriages chugged past—usually coming to a stop where they would block traffic. When the first under-powered airplane left the earth, Mac was seven, and also under-powered. However, he increased in stature and in power to such an extent that by 1914 we see him working on "aeroplanes" for George Cove and other old pilots at the Mineola Aviation Field. As he had studied electricity for three years after leaving high school in 1911, he was able to fix magnetos, which at that stage of the air game were one of life's mysteries.

1916 found him worrying about the safety of the country, so to insure that it would survive the tussle with Villa, he joined the 10th Infantry of the New York National Guard, and the country was saved. In the summer of 1917 he transferred to the Aviation Section, Signal Officers' Reserve Corps, and attended the ground school at Cornell, Ithaca, N. Y., and received his first flying training at Ellington Field, Houston, Texas. He was commissioned 2nd Lieutenant May 3, 1918, and served until October as instructor of Day Bombing Raiding at Ellington—never having done any actual Day Bomb Raiding himself. For this reason he was put in charge of all Day Bombing at Gerstner Field, Lake Charles, La., which possibly accounts for some of the wild misses made by the bombardment pilots overseas. However, I believe Mac blames this almost entirely on the bomb sights of those days.

Having defied the Kaiser and his minions from the advanced observation post of Gerstner Field, Mr. McMullen resigned from the Army in February, 1919, assured that democracy was safe for the time being He now added an air of culture to the surroundings of Casey Jones by joining the Curtiss company in May, 1919, where he tested, demonstrated and instructed until August, 1920, when he sailed for the Argentime to lend the weight of his presence to Mr. C. W. Webster, president of the Curtiss Aeroplane Export Corporation.

To C. W. Webster, Lawrence Leon and Mac is due much credit for their persevering work in South America. They took down Orioles and Jennies, the Orioles being the first consignment. In Orioles they accomplished what I don't think at that time had been accomplished in them up North—they instructed and soloed the boys in C-6 Orioles. They taught a number of wealthy ranchmen who had their headquarters in Buenos Aires. These ranchers used to spend a week or even two weeks going out for inspections of their ranches. But once Mac had operated on them and turned them into pilots, they could fly out to their ranches on Friday and be back in the city on Monday. This gave them practically the whole week to loaf in the city, thus demonstrating at once the real utility of an airplane. Mac taught a man of forty-seven to fly in 1920—and he's still flying. Lawrence Leon taught several over forty; and a number of them are still commuting in their own ships. The young men they taught in 1920 are the backbone of civilian aeronautics in the Argentine today.

He was down there a year, returning in October, 1921, and until 1924 was with Casey Jones again. The inspiration he drew from his long association with that great man may account for Mac's success in life, and then again it may not. I have known Casey for many years myself, and I can't say that it has done me any lasting good. It should have, of course, but it hasn't. Yet I know of young men who have taken only one glance at Casey Jones and felt spurred on to accomplish great things. Perhaps my own failure to profit by his example was due to the fact that usually I got only a rear view of him in races, as he flew past me. A rear view of Casey in that old Clipped-wing Oriole used to depress many of us in slower planes. Casey, by the way, seems to be growing old gracefully as an inspiration to the young —I heard him over the radio the other day exhorting the children in Macy's Boys' Club on the benefits of air travel in Condors. That goes to show that if you young pilots will only work hard you may eventually end up as radio performers. Elinor Smith got her start flying, you remember.



Bill McMullen talks it over with Captain Herrera of the Chilean air corps

Let's see—we were talking about McMullen. Well, the old boy did instruction and photographic work, and by 1924 was sufficiently advanced to associate with E. P. Lott, now and for many years one of the master minds of N. A. T. Lott flew the private mail run from New York to the Balsams up in New Hampshire in 1923, and Mac flew it in 1924. Until 1927 he was with Curtiss, soaking up inspiration, as I've indicated. He instructed many of the boys who now are regarded as fairly old-timers, did photographic surveys, flew in a few races in New York and Philadelphia, and chased around here and there on cross-country flights until the spring of 1927, when he went to Chile to supervise the erection and first use of the Curtiss Hawks sold to the Chilean Air Service.

Mac tested and delivered the nine machines in that order, and as Curtiss representative, made flights to the Argentine, Bolivia, Peru and Uruguay during the next three years, part of the time with Jimmy Doolittle, returning to the United States in 1930.

He is now with the Bellanca company, attached to the New York office for sales and demonstration work, which appointment carries with it the privilege of calling George Haldeman by his first name. George, by the way, first became known for his ocean flight, but later achieved immortality by his discovery that mixing it with tomato juice and cracked ice would take away the awful taste of sauerkraut juice, leaving the healing medicinal qualities intact. Wherever you go now in the kraut-raising districts you will find little roadside shrines with a statue of George as the patron saint

(Continued on following page)



. . . ANOTHER SUCCESSFUL FLIGHT DEMONSTRATION

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(*PersonAIRlities continued*)

of the kraut-tossers.

Mac is always solving some abstruse aeronautical problem. Every now and then he drops into my office, finds me wrestling with some problem, and leaves me with it all cleared up. In fact, a chat with Mac often enables me to throw away not only the problem, but also the solution, and pass on to other matters. For instance, I was asking him the other day about the winds encountered in a flight over the Andes from Chile to the Argentine. I've heard tall stories about the terrible gales encountered there, and wondered what could be done about it. In fact, I was thinking it might be possible to send our Lame Duck Congress down there to act as a windy counter-irritant, when Mac dropped in and tied the whole thing in a knot for me, as usual.

He tells me that in the old days the pilots used to make quite a mystery of their flights across, leaving you to surmise that they had awful battles and only got through because they were the sort of fellows who got through anything. A lot of hot reputations got manufactured at first, but now it appears that flying over the Andes is pretty much like flying over the Rockies, for instance. It seems—according to Mac, who ought to know—that there are very turbulent air conditions in the lower altitudes, in the valleys, but up above 18,000 feet the air is comparatively smooth. He has flown across when there was no wind upstairs, but that was an overcast day. Usually there is a constant drift from the west, the same as there is here. Our drift, of course, is caused by the partial vacuum constantly being manufactured over the political regions of Washington, and I suppose that there must be some condition like that down there in the Argentine. I have no reason to suppose that the Argentines are any more fortunate with their representatives than we are with ours. They probably have their Borahs and Heflins and Ham Fishes too.

Anyhow, Mac says the drift in the passes is caused by the wind up above creating a vacuum on the lee side of the hill. So the thing to do to avoid rough air is either to fly above 19,000 feet or buy a ticket on the Trans-Andean Railroad. Now that you have this information you are free to use it in any way you see fit. It's no good to me, either.

I HAD a visitor the other day. He glided in at about quarter throttle, his feet barely ticking over the linoleum of my office, and made a landing in front of my desk. He was one of those silent men who just look at you, waiting for you to speak. I recognized him at once from his pictures. I got right up and said, "Have a seat, Mr. Coolidge." You know, Calvin Coolidge is in the writing business now, and I naturally supposed that he had dropped in to see if he could get his stuff in AERO DIGEST. You see, we have Herbert Hoover, Jr., with us already, and it would be only natural for Calvin not to want one of those Hoovers to get ahead of him. So I said, "Speak up, Mr. Coolidge. Only a few Democrats around here, and nobody pays any attention to them. What's on your mind?"



Howard Stark

Well, as it turned out, it wasn't Calvin Coolidge at all. It was Howard Stark, the only pilot I know of who looks, acts, talks and even thinks like Mr. Coolidge. He could attend a Republican National Convention and get the nomination on his looks. And as he never says a word until after he has thought it over for a long time, they'd have him nominated before he could get it out that he wasn't Coolidge.

Howard got back from South America last September. He had been flying the night mail for NYRBA from Buenos Aires to Porto Alegre, halfway stop to Rio de Janeiro, to catch the passenger ship that had left Buenos Aires the day before. If by any chance that passenger ship, a Commodore, didn't get to Porto Alegre, Stark continued on to Rio in his Fleetster, making the longest mail run I've heard of—about 1,400 miles, and half of it at night. In fact, of his 3,000 hours' total air time, about half has been at night.

He's one of the best night-flying and instrument-flying pilots in the country. Such a bad weather authority as E. P. Lott thinks Stark is good, and I wouldn't be surprised if even the great W. L. Smith would admit that Stark comes as near W. L. Smith as any mere human being can come—which is a great admission for "Cleveland's Lindy" to make. Did you ever hear that W. L. "Lindy" story, by the way? It seems a reporter wrote up a very fancy and long-winded account of the sayings and doings of the great W. L.—to whom is due great credit for the encouragement and development of instrument flying. The reporter ran the biography in a Cleveland paper under the distressing title, "Cleveland's Lindy," and then out at the airport one day he borrowed some $200 from W. L., promising to repay it when the proceeds of the Great Biography should be available. However, if W. L. has ever seen that reporter or his $200 again, I haven't heard of the event. And at last accounts, the mere mention of "Cleveland's Lindy" was enough to cause an eruption in W. L.'s office. Now, if W. L. had given me his biography, I wouldn't have charged him a cent for running it, though perhaps it was worth $200 to him to get his picture in the home paper. At least, I hope so, because I want to see everybody happy.

But we've been losing sight of Howard Stark—you know, when the sun appears we forget the stars. But after burying W. L. in the last paragraph we again can see Howard, struggling through the night with his load of mail. He flew that NYRBA run from February to September, 1930, before which he was on N. A. T. between New York and Cleveland for two years, during which he had ever before him the stimulation afforded by a daily sight of W. L. Smith, reigning deity of the N. A. T. Before that again, in 1927, he was chief pilot of Colonial Airways, flying the night mail run between Boston and New York, at first in his own Whirlwind Stinson, on contract, and later in Colonial's Fairchilds and Pitcairns.

During all of this mail flying, most of it at night, Stark practiced instrument flying—blind flying, as it used to be called—and today he is one of the greatest exponents of the art. He has flown entirely by instruments for as long as three and one-half hours, through rain, fog and thunderstorms on the South American run, and maintains that one may do so for as long as the gas lasts. He has flown with static rippling over his plane as he went through—not around—thunderstorms, and was no more concerned than was Coolidge when he walked over a couple of Congressmen.

The way Stark happened to become a pilot was this: He saw a Curtiss ad in May, 1922, advising the high-spirited of the land that Jennies could be purchased, complete with OX-5, for $650. Stunned at this intelligence, Stark went to Curtiss Field, looked admiringly at a Jennie, and bought it. He not only didn't know how to fly, but didn't even know if he would like flying, for up to that time he had enjoyed only one flight, and that of only a few minutes, in France. However, there he was and there the Jennie was. At that time he was a chauffeur, working until six every day, so only in the evenings could he take instruction. He had half an hour with a pilot named De Mont, then went away for the summer, leaving his Jennie in storage. When he came back he had about an hour more of instruction, picked up now and then from six different pilots. The last pilot who took him up told him to take the controls to make a landing. Stark feared he wasn't doing right, so let go, expecting the instructor to take hold. The Jennie started to fall off on a wing, both Stark and his pilot grabbed for the stick at the same time, and the Jennie landed herself, paying practically no attention to either one of them.

Coming to the conclusion that he was less apt to become confused if he went alone, Stark now went solo, flew for ten hours, doing very well, and then decided to thrill the home town folks at Pawling, New York, now famous as the country seat of Lowell Thomas, the first author to use automobile factory production methods in literature and turn out assembled books. At Pawling, the bold Stark made a perfect landing thirty feet above the earth. Fortunately, he had not then learned that airplanes could be repaired when dented, so that landing cleared the market of one Jennie. He bought another one, returned to Pawling, and landed intact this time. Then he bought a Waco and flew to Cuba, sold it and got a

(*Continued on next page*)

"FLYING CONDITIONS ARE PERFECT IN LOS ANGELES COUNTY"... SAY THE FLIERS



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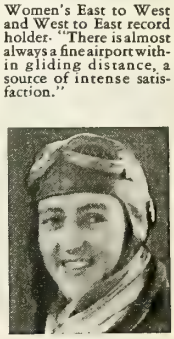
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Aide to Byrd North Pole and Transatlantic Flights. "Los Angeles County furnishes ideal flying territory, weather conditions permit all-year flying."

(PersonAlRlities continued)

Stinson, and carried passengers until 1927, when he joined Colonial and began to fly mail.

It was in that old Stinson, the first one that Eddie turned out, by the way, that Stark flew from Boston for Paramount News Reel to get pictures of the *Bremen* fliers. He flew to Montreal and then to Murray Bay, returning direct with the pictures, and flying over country much of which had never had anything above it but clouds, birds and mortgages. He tells me that his career has been singularly uneventful. He has never even had a dead motor landing, although he did get forced down occasionally by weather. By the way, he never flies blind unless he knows that he has comparatively good weather at his destination. In fact, despite the great amount of bad weather flying he has done, Stark is a very cautious pilot, in which he also resembles the cautious gentleman from Northampton, who was smart enough to choose not to steer the ship of state through the recent tough financial weather.

PILOT BIRGER JOHNSEN was born in Liland, Ofoten, Norway, November 12, 1893, and graduated from the Skiensfjordens Mekaniske Fagskole, at Porsgrund, as soon as he could pronounce it without tripping. It took him twenty-one years of hard study to be able to get those names past his teeth without cracking the enamel. That's why Norwegians invariably make good citizens — they have to spend so much effort learning their own language that they have no energy left for raising hell. We'd probably elevate the moral tone of Chicago if we made Scandinavian the official language of that town.



Birger Johnsen

In 1914 Birger Johnsen was twenty-one, the standard age for Norwegians to emigrate to the United States. In fact, Norway, like Nova Scotia and Newfoundland, is practically a nursery for future Americans. Norwegians, Nova Scotians and Newfoundlanders start life with two destinations in view: heaven, with stop-over privileges in the U. S. A. And, of course, once they get here they are side-tracked.

Birger went to work as an aeronautical engineer and draftsman with Walter H. Phipps, New York, for a year, was with the Bosch Magneto Company, Springfield, Mass., as magneto expert and research engineer for a year and a half, and then enlisted in the U. S. Air Service during the war as a magneto expert, later transferring to the Engineering Department as engineering officer. After the war he was assistant to the chief electrical engineer of the State of California, at Sacramento, and was well on his way toward becoming somebody of importance when a disease he had caught in childhood broke out and made him what he is today.

Back in Norway, in 1912, he had contracted a case of aeronitis through being bitten by a Henri Farman pusher. Now, mind you, this poor chap was still in college, learning to say "Skiensfjordens Mekaniske Fagskole, Porsgrund, Ofoten," and was fitting himself to make safety-matches, haul protesting cod-fish over the gunwale, bathe sardines in olive oil, or indulge in some other delightful Norwegian occupation, when all of a sudden a Frenchman appeared with this Farman pusher.

Now, Frenchmen are always unsettling, especially when they fly around in Henri Farmans, so right away one perfectly good Norwegian was ruined for the sardine business. He got into this old Farman, in front of a Gnôme that would only run wide open, and proceeded to learn the navigation of the air. In that Farman, which had no wheels, the lower longerons acted as skids, so Birger had the skids put under him early in his career, beating a flock of vice presidents by eighteen years. The following year he had more instruction in a Sommers tractor biplane, and became a finished pilot, as pilots went in those days.

During the next seven years Birger thought he was cured of the aviation fever, but the germs were still in his system, for in 1919 he suddenly developed a flushed and feverish condition, couldn't find the quinine bottle, and the next thing he knew he was sitting down in the desert between Yuma and Gila Bend, Arizona, staring at a Canuck holding a defunct OX-5 in its arms. It seems that during the height of his fever he had bought the thing and flown away seeking adventure, which was promptly handed to him. The heat of that desert was 120 in the shade, and there was no shade for a radiator. So the water had evaporated in steam, accompanied by all movement in the OX-5. Johnsen spent two days in that desert, which is so hot that lizards only run three yards and then have to flop over on their backs to cool their feet off. He was rescued by a party of scientists who had been sent out to search for at least one dry spot in the States to prove prohibition a success.

For the next seven years Johnsen was in business for himself, carrying passengers, instructing, giving exhibition flights, and doing photography throughout California, Oregon, Nevada, Arizona and Lower California. In 1927 he was employed as senior pilot on the mail and passenger run between Tampico and Mexico City for Cia. Mexicana de Aviacion S. A., Tampico, Mexico (now Pan American Airways). In 1928 he was with Travel Air Manufacturing Company, Wichita, Kansas, testing and ferrying, also in charge of Hutchinson School of Aviation, Hutchinson, Kansas, and Gribi Air Service, Chickasha, Oklahoma. In 1929 he was with China Airways, Shanghai, China, as senior mail and passenger pilot on the run up the Yangtze Kiang River from Shanghai to Hankow, China. Last year he was senior pilot for the NYRBA Lines in South America, flying Commodores and Sikorsky S-38's on regular mail and passenger runs. His total time is approximately 5,800 hours. Of this 1,600 hours are in Class 3-C and D. Night flying is approximately 400 hours. He has flown practically all types of American-made ships and quite a few foreign, without a single crack-up of any sort.

Johnsen dates back to the days when flying wasn't a profession but a sort of gift. He used to get $100 for a stunt ride and $25 a head for ordinary passenger hops. He has taken in as much as $600 in a single day with one Canuck and thought nothing of it. Just think, if there hadn't been so many schools started and so many young hopefuls heaved into the atmosphere, we old-timers might still have been doing the same thing. And then again, we might not. After all, the public only remains simple for just so long, and then the Republicans go out and the Democrats go in.

Johnsen was about the most handicapped pilot who ever flew in Mexico or South America, for he was born and brought up about 300 miles north of the Arctic Circle and was used to temperatures of thirty below zero. You know, up in Norway when it gets above zero everybody buys fans. Well, when he hit Mexico on his first trip in 1920 the thermometer registered about 110, so the only way Johnsen could exist was by sitting on a cake of ice and drinking bottle after bottle of *cerveza*. As most of this was imported from Germany, the breweries had to work overtime, resulting in that political upheaval over there known as the *Bierputsch*.

But it was 600 miles south of the equator that Johnsen found the ideal climate, not too hot, not too cold, with a pleasant wind blowing the year 'round, and always from the same direction. No mosquitoes and ideal living conditions ruled in the pleasant city of Fortaleza, Ceara, Brazil, where he was stationed while flying for NYRBA. He says the flying conditions in South America are rather good once you get used to rain. In the Amazon district it rains pitchforks nearly every day, but there is no fog.

This old Norwegian has sampled every kind of weather there is, including the fogs of China. By the way, did you know that there are no laundries or chop suey houses in China? Chop suey was invented by an American who got confused in a kitchen— and the Wickersham report by one who got confused in a speakeasy. Here are some of Johnsen's notes on China:

"Flying conditions up to Yangtze River to Hankow are not so good in the winter time because of heavy, low-lying fog. Time and again we had to sit down in the river, and either wait or taxi for hours before the fog lifted. Speaking of pirates or bandits, there are thousands upon thousands of them all along the river banks and on the river in their junks and sampans. Thousands of native merchant junks are pirated annually. They usually kill the crew and throw them overboard and take the junk, cargo and all.

(Continued on page 219)

Just a little plate...



but it means *a lot!*

In storms, darkness or fog a glance at this little plate gives assurance. For the name Western Electric stands for dependable communication.

Western Electric airplane telephone apparatus is backed by 50 years' experience in making Bell telephones. It meets Bell System standards of quality and reliability. It has proved its worth under all flying conditions on fifteen transport lines. It is serving faithfully in many privately owned planes.

When your ship is Western Electric equipped you fly efficiently, confidently, receiving Government weather broadcasts, directional beacon signals and valuable information from airports along your route. For complete details write to Western Electric Company, Dept. 255AD, 195 Broadway, New York.

*Western Electric**

Aviation Communication Systems

MADE BY THE MAKERS OF BELL TELEPHONES

**Northern Electric in Canada*

Visit the Western Electric exhibit, Booths 111-115, National Aircraft Show, Detroit, April 11-19

1930's GREAT WERE MADE WITH



SPEED!

In a load-speed-distance test, Lee Shoenhair made six new world's records in two days' time, using Kendall Oil.

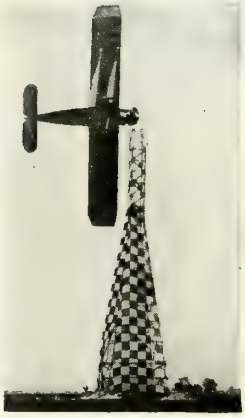
In the "On-to-Chicago" Derbies, Kendall figured in 6 first, 6 second and 4 third prizes, as well as 4 fourth and 3 fifth places.

Over 84 per cent of all first, second and third prizes at the Chicago Air Races were won by pilots, both men and women, who used Kendall Oil.

ENDURANCE!

Dale Jackson and Forrest O'Brine again set a world's refueling endurance record of 27 days. Kendall Oil kept their engine lubricated during the 647 hours of continuous flight.

S. C. Huffman, in a solo non-refueling endurance flight, set a light plane record of over 25 hours. Kendall was his choice.



A turn around the pylon at the 1930 Air Races

ALTITUDE!

George Haldeman, who used Kendall Oil on many record flights, chose the same lubrication in setting a commercial aircraft altitude record of 5¾ miles.

DISTANCE!

In the All-American Flying Derby, twice across the continent in a 5500-mile race, 17 out of 18 pilots, including the winners, specified Kendall lubrication.

Mrs. Keith Miller used Kendall Oil in her record-breaking flight across the continent and return in 46¾ hours.

EFFICIENCY!

In the National Air Tour, testing laboratory of speed-efficiency covering a flight of nearly 5000 miles, 17 of 18 competing planes were lubricated by Kendall.

E. A. Johnson of Dayton, Ohio, mounted a strictly stock 6-cylinder automobile motor on an airplane and made a remarkable efficiency demonstration. Again, Kendall proved its reliability.

BUY AT THIS SIGN PENZBEST KENDALL MOTOR OILS IT IS YOUR PROTECTION

KENDALL

Use the

AIR TRIUMPHS KENDALL



AVIATION'S progress has long been emphasized by the achievements of Kendall's flying legion. In 1930, famous pilots, men and women, set many new records of speed, endurance, altitude, distance and efficiency—choosing Kendall Oil as their unfailing companion to success. No less noteworthy was the performance of sturdy planes and dependable engines in making these records.

Although the complete list of famous pilots who drove their planes to victory with Kendall during the past year is not printed here, a review of the events, listed on the page opposite, is a guide to Aviation's Hall of Fame.

Manufacturers, airport and flying school officials, professional or private pilots and mechanics have given their unqualified approval to aviation's greatest oil. Their experience and wisdom is an example for every aviation-interested person.

Kendall Oil is made from the world's finest crude oil —the Bradford Grade of Pennsylvania. Kendall refining methods produce a lubricant that has every flying quality—purity, reliability, outstanding performance. Kendall will give a full thirty hours of air service without refilling. Merely maintain the oil level.

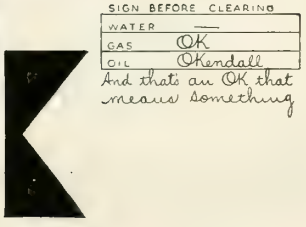
For a list of airports where Kendall is obtainable and complete information regarding its lubricating qualities, address, Kendall Refining Company, Bradford, Penna.



Men who know motors recommend Kendall

Meet "OLD MAN KENDALL" at the International Aircraft Show at Detroit, April 11 to 19. He is a likeable, jolly, wise "character" who will answer your questions on lubrication. Look him up at the Kendall Oil Exhibit.

OIL REFINED FROM 100% BRADFORD GRADE OF PENNSYLVANIA CRUDE



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Trade Mark "TABLOID" Brand
First-Aid No. 714
(Pocket Kit)
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'TABLOID' First-Aid No. 714 (Pocket Kit) is the indispensable protective service for factory, home and airplane.

Every item contained in this small, compact, practical, inexpensive outfit is noted for a standard synonymous with every 'Tabloid' product.

'Tabloid' First-Aid is furnished in all types and sizes to meet every emergency possible.

Protection
'TABLOID' FIRST-AID PRODUCTS

Standard List of Contents
Trade Mark 'TABLOID' Brand
First-Aid No. 714
(Pocket Kit)

2—'Vaporole' Aromatic Ammonia
2—'Vaporole' Iodine
1—'Tabloid' Bandage Compress
2—'Tabloid' Adhesive Compress
1—Tube of 'Borofax' (Boric Acid Ointment)
1—Adhesive Plaster, ½ in. x 1 yd.
1—'Tabloid' Bandage (Open Wove, 2½ in. x 3 yd.)
1—Tube of 'Carofax' (Carron Oil, Solidified, with 2% Phenol)
1—Direction Card.

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Enclosed is One Dollar ($1.00) for new, instructive and educational 'TABLOID' FIRST-AID MANUAL.
Name.....
Address.....

DESCRIPTIONS OF APPROVED TYPE AIRPLANES AND ENGINES NOW IN PRODUCTION IN THE UNITED STATES

ON the following pages, condensed information and illustrations are given of approved type airplanes and engines now produced in the United States. The list is representative of the industry, although in a few cases products are omitted because data in the desired form arrived too late for inclusion here. However, this feature will be continued in forthcoming issues of AERO DIGEST, presenting each month groups of approved type plane and engine descriptions. These will list in a uniform style more of the well-known American airplanes, as well as the newer types which secure Approved Type Certificates of the Department of Commerce. In making this presentation AERO DIGEST had the coöperation of the individual manufacturers and Department of Commerce officials, whose assistance made this feature possible.

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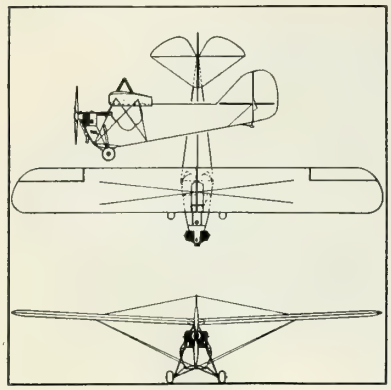
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AERONCA

C-2 and C-3

Aeronautical Corporation of America, Cincinnati, Ohio

Specifications: Models DeLuxe C-2 and Duplex C-3, respectively. Span 36 feet. Length overall, 20 feet. Height overall, 7 feet 6 inches; and 7 feet 10 inches. Wing area (including ailerons), 142.2 square feet. Power loadings, 26.9; 25 pounds per horsepower. Wing loadings, 4.92; 6.15 pounds per square foot. Aeronca E 107A of 30 horsepower, Aeronca E 113 of 40 horsepower. Weights empty, 426; 466 pounds. Useful loads, 274; 409 pounds. Gross weights, 700; 875 pounds.



Performance: High speeds, 75; 80 miles per hour. Cruising speeds, 60; 65 miles per hour. Landing speeds, 30; 35 miles per hour. Rates of climb, 550; 450 feet per minute. Climb in 10 minutes, 5,000; 4,000 feet. Service ceilings, 16,000; 12,000 feet. Radii, 240; 200 miles. Gasoline capacities, 8; 8 gallons.

The fuselage is constructed of chrome-molybdenum steel tubing, fabric covered. The ailerons are of duralumin; the tail surfaces of welded steel tubing, fabric covered, and externally wire braced. The wing is constructed of spruce spars and solid spruce compression ribs with dural leading and trail ing edges; it is double-wire drag-braced throughout. Fabric is used for covering, The landing gear is a stream-lined double-tripod with heat-treated chrome-molybdenum steel axle. Propeller is Hartzell. Both models are equipped with Goodyear Airwheels, standard instruments, fire extinguisher and have enclosed baggage compartments. Model C-2 is a one-place ship; Model C-3, a two-place ship.

For additional information see advertisement on page 71 of this issue

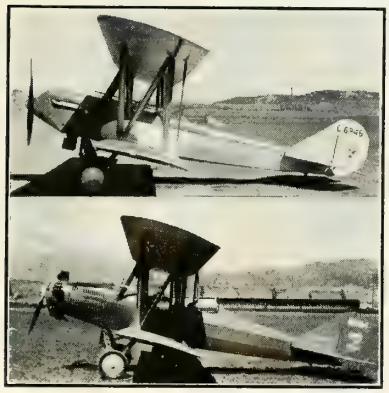


ALEXANDER

EAGLEROCK BIPLANE A-2, A-15

Alexander Aircraft Company, Colorado Springs, Colorado

Specifications: Span, upper wing, 36 feet 8 inches; lower wing, 36 feet 8 inches. Length overall, 24 feet 11 inches (Model A-15) 25 feet 11.25 inches. Height overall, 9 feet 10 inches. Wing area (including ailerons), 330 square feet. (Models A-Z, A-15, respectively) OX-5 Curtiss 90 horsepower; Kinner K-5 of 100 horsepower. Power loadings, 27.1; 24.5 pounds per horsepower. Wing loadings, 7.4; 7.4 pounds per square foot. Weights empty, 1,459; 1,539 pounds. Useful loads, 983; 917 pounds. Gross weight, 2,442; 2,456 pounds.

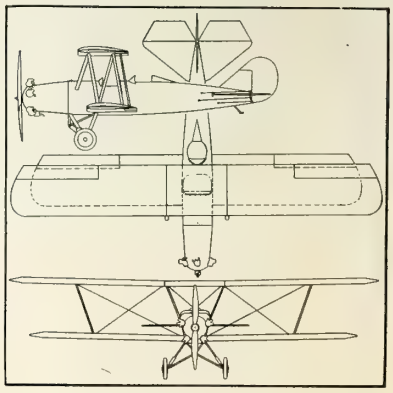


Performance: High speeds, 100; 100 miles per hour. Cruising speeds, 85; 88 miles per hour. Landing speeds, 38; 38 miles per hour. Rate of climb, 460; 480 feet per minute. Service ceilings, 9,000; 9,400 feet. Gasoline capacities, 46; 47 gallons.

Three persons, including crew, are accommodated.

Fuselage is of steel tube construction, torch welded at joints, covered with fabric and aluminum. Ailerons have wood framework, fabric covered tail; surfaces steel tubed, fabric covered. Wings have a wood framework, fabric covered, and metal trailing edge.

Landing gear is split-axle type, equipped with rubber cord shock absorbers, Firestone, Goodrich or Goodyear tires (not optional), Bendix or Goodrich brakes. Propeller (Model A-15) is either wood or steel (Model A-Z, Supreme wood). Instrument panel is Alexander, instruments, Pioneer. Eclipes or Heywood starter on Model A-15 is provided as standard equipment. The controls are dual.

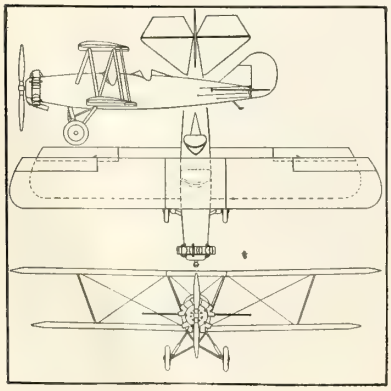


ALEXANDER

EAGLEROCK BIPLANE A-14, A-1,A-3

Alexander Aircraft Company, Colorado Springs, Colorado

Specifications: (All three models) Span, upper wing, 36 feet 8 inches; lower 36 feet 8 inches. Height overall, 9 feet 10 inches. Wing area (including ailerons), 330 square feet. (Models A-14, A-1, A-3, respectively) Lengths overall, 25 feet 7.5 inches; 23 feet 10.86 inches; 24 feet 9.5 inches. Wright J-6 of 165 horsepower; Wright J-5 of 200 horsepower; Hisso "A" 150 horsepower. Power loadings, 15.64; 12.46; 17.4 pounds per horsepower. Wing loadings, 7.84; 7.5; 7.9 pounds per square foot. Weights empty, 1,651; 1,705; 1,877 pounds. Useful loads, 937; 786; 741 pounds. Gross weights, 2,588; 2,491; 2,618 pounds.



Performance: High speeds, 118; 130; 114 miles per hour. Cruising speeds, 108; 110; 97 miles per hour. Landing speeds, 40; 39; 40 miles per hour. Rates of climb, 720; 1,080; 720 feet per minute. Service ceilings, 13,200; 17,900; 12,850 feet. Radii, 600; 580; 575 miles. Gasoline capacities, 67; 70; 70 gallons.

Three persons, including crew, are accommodated. The fuselage is of steel tubing, torch welded at joints, covered with fabric and aluminum. The framework of wings is of wood, externally braced, fabric covered. Trailing edge of the wings is of metal. Landing gear is of the split-axle type with rubber cord shock absorbers, Goodrich or Goodyear tires (not optional), Bendix or Goodrich brakes. Propeller is Hamilton-Standard, (Supreme wood on Model A-3) starter is Eclipse or Heywood, instrument panel is Alexander, instruments are Pioneer, and controls are dual.

Ailerons are box beamed and wood-ribbed construction, fabric covered.





Now... that there are others
AERONCA'S LEADERSHIP IS PROVEN

AERONCA had no competition last year. The AERONCA C-2 was the *pioneer*—unique, unprecedented in the light airplane field. Here was an airplane that took off in 70 feet, climbed with amazing ease, possessed an enormous gliding angle, landed slowly and safely at 30 miles per hour. It cost only a cent-a-mile for gas and oil; its price range was well below $2,000; novices learned to fly it in as little as two hours.

It was the *first* plane to make flying practical and safe for the average person. Alone in its field—it was the sensation of the year!

And then competition came with a rush! AERONCA'S startling performance and success inspired imitation! The scores of light airplanes being hurried on to the market in 1931 are tributes to the epoch making accomplishments of the 1930 AERONCAS. But such competition only emphasizes AERONCA leadership.

While others are vainly striving to match AERONCA 1930 performance —the result of unique design, perfected after five years of development work—AERONCA has left 1930 far behind and today is setting new standards of performance and value.

The new AERONCA DeLuxe C-2 shows eleven definite advancements in appearance, comfort and convenience over the 1930 C-2. And in the AERONCA Duplex C-3, we are again *pioneering* with a two passenger plane affording side-by-side seating, in a low hung coupe-type cockpit, which renders obsolete ordinary tandem type two-seaters. Powered with the 40 H.P. AERONCA E-113 motor, which has passed the gruelling 50-hour test and received the Government's Approved Type Certificate, the AERONCA Duplex has all the phenomenal maneuverability of the AERONCA single-seater. It incorporates the comfort, appearance and performance of ships costing three times as much.

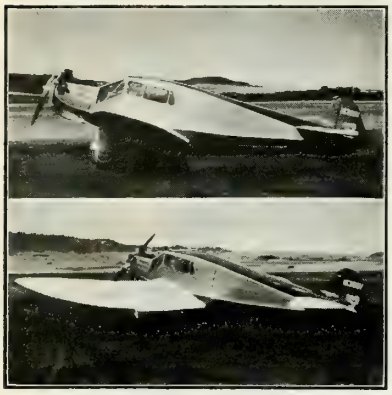
Some good dealer territories still open. Write or wire for details of the most profitable aircraft franchise in America.

THE AERONAUTICAL CORPORATION OF AMERICA

LUNKEN AIRPORT AERONCA CINCINNATI, OHIO

ALEXANDER
BULLET C-7
Alexander Aircraft Company, Colorado Springs, Colorado

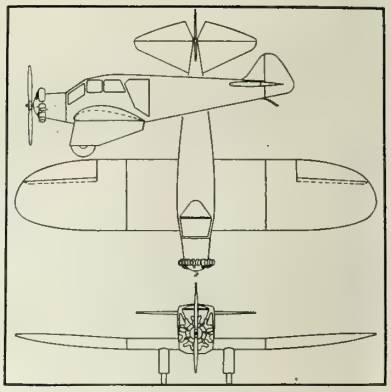
Specifications: Span, 36 feet. Length overall, 26 feet 10 inches. Height overall, 7 feet 9 inches. Wing area (including ailerons), 208 square feet. Wright J-6 of 165 horsepower. Power loading, 16.9 pounds per horsepower. Wing loading, 13.3 pounds per square foot. Weight empty, 1,720 pounds. Useful load, 610 pounds. Gross weight, 2,780 pounds.



Performance: High speed, 148 miles per hour. Cruising speed, 119 miles per hour. Landing speed, 48 miles per hour. Rate of climb, 700 feet per minute. Climb in 10 minutes, 7,000 feet. Service ceiling, 17,000 feet. Radius, 440 miles. Gasoline capacity, 45 gallons.

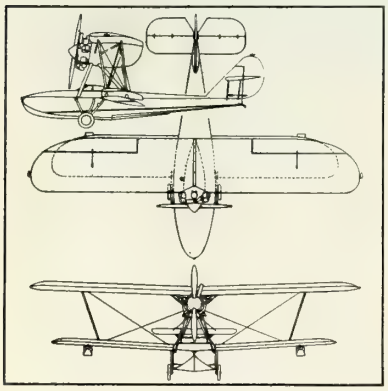
The fuselage is steel tubed, torch welded at joints. Motor mount is detachable. Fuselage is covered with fabric and aluminum. Frize ailerons have a wood framework covered with fabric. Tail surfaces have a metal framework covered with Grade A Flightex. Full cantilever wings are built up of box spars with spruce cap strips and plywood planking, covered with Grade A Flightex. Landing gear is retractable full-cantilever, or fixed and faired optional. Brakes and wheels are Bendix, with hydraulic mechanism standard. Spring and oleo shock absorbers produced by the Alexander company are provided. Equipment includes metal propeller, Eclipse hand starter and an Alexander instrument panel with standard instruments.

The Alexander Bullet accommodates four persons, including crew, and 100 pounds of baggage. Seats are arranged by two pairs in tandem. The pilot's vision in all directions is exceptionally extensive.



SAVOIA-MARCHETTI
S-31 AMPHIBION
American Aeronautical Corporation Port Washington, Long Island, New York

Specifications: Span, upper wing, 34 feet 1.5 inches; lower wing, 30 feet 1.06 inches. Length overall, 24 feet 11.81 inches. Height overall, 9 feet 11.75 inches. Wing area (including ailerons), 286 square feet. Kinner R440 125 horsepower. Power loading, 17.6 pounds per horsepower. Wing loading 7.7 pounds per square foot. Weight empty, 1,462 pounds; useful load, 738 pounds; gross weight, 2,200 pounds.



Performance: High speed, 98 miles per hour. Cruising speed, 80 miles per hour. Landing speed, 38 miles per hour. Rate of climb, 700 feet first minute. Climb in 10 minutes, 4,500 feet. Service ceiling, 8,500 feet. Radius, 320 miles. Gasoline capacity, 28 gallons.

The framework of the wing and ailerons is of wood, fabric covered. Stabilizer framework is of wood; that of fin, rudder, elevator, steel tubing, fabric covered. The framework of the hull is of wood covered with fabric. The hull has spruce and ash frames, fabric-covered plywood sides and deck, double planked cedar bottom. The landing gear is of steel and duralumin; a hand lever operates a hinged rear strut to raise wheels. Rubber cord shock absorber and U. S. Royal tires, Paragon propeller, Heywood starter and Pioneer instrument panel are provided.

The ship accommodates three persons. Seating arrangement is two front and one rear. Controls are dual. Equipment includes anchor, life preservers, first aid kit, fire extinguisher, navigation lights, battery and switch, engine and cockpit covers

For additional information see advertisement on page 32 of this issue



SAVOIA-MARCHETTI
S-62 FLYING BOAT
American Aeronautical Corporation Port Washington, Long Island, New York

Specifications: Span, upper wing, 50 feet 10 inches; lower wing, 45 feet 11.25 inches. Length overall, 36 feet 1 inch. Height overall, 13 feet 6 inches. Wing area (including ailerons), 699 square feet. Isotta-Fraschini 500 horsepower. Power loading, 14.3 pounds per horsepower. Wing loading, 10.2 pounds per horsepower. Weight empty, 4,500 pounds; useful load, 2,530 pounds; gross weight, 4,620 pounds.



Performance: High speed, 132 miles per hour. Cruising speed, 118 miles per hour. Landing speed, 49 miles per hour. Rate of climb, 1,000 feet first minute. Climb in 10 minutes, 4,000 feet. Service ceiling, 14,000 feet. Radius, 530 miles. Gasoline capacity, 127 gallons.

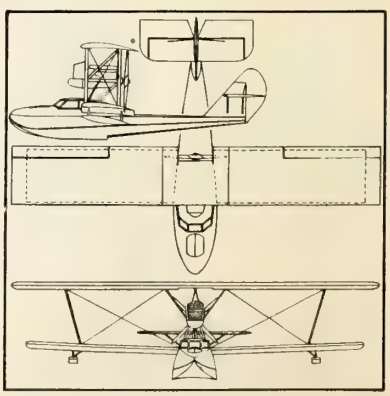
The framework of the hull is of wood; sides and deck are of plywood and the bottom is double planked cedar. The hull is covered with fabric. Ailerons and tail surfaces (with the exception of the stabilizer, which is of wood) are of steel tubing covered with fabric. The framework of the wings is of wood, fabric covered and doped in the usual manner.

The rudder and elevators are balanced.

Propeller is pusher-type, four blades. Starter is the air compressor type.

The ship accommodates eight persons and baggage in the enclosed cabin, seated two at the front, three at the center and three at the rear.

Equipment includes anchor, life preservers, fire extinguisher, magnetic compass, altimeter, vertical and horizontal inclinometers, water thermometer, oil thermometer, gasoline pressure gauge, gasoline level gauge, oil pressure gauge.





Illustrated here, actual size, is the NEW Elgin Compass — similar in appearance to previous Elgin models, but entirely new in performance.

ELGIN

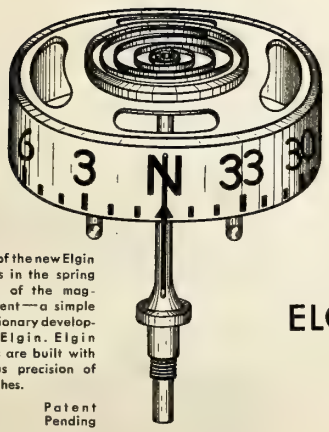
announces a new stabilized compass...

QUICKLY — steadily — surely — this new Elgin Compass indicates the true course *without undue oscillation.*

The stabilization of the new Elgin Compass is accomplished by means of a new type of spring suspension of the magnetic element . . in a special damping liquid.

There is no side-swing to keep you guessing — no uncertainty about the exact reading. Elgin gives you perfect accuracy under all conditions.

Pilots, Manufacturers and Transport Operators will want full information about this remarkable new development. Details will be sent on request.



The secret of the new Elgin Compass is in the spring suspension of the magnetic element — a simple yet revolutionary development by Elgin. Elgin Compasses are built with the famous precision of Elgin Watches.

Patent Pending

ELGIN NATIONAL WATCH COMPANY

AERONAUTICAL CHAMBER OF COMMERCE

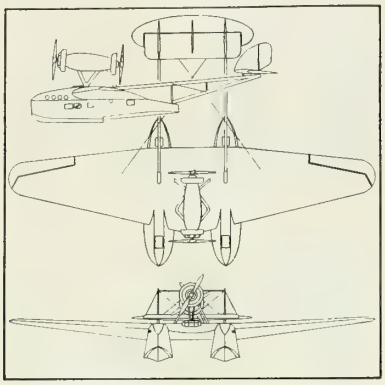
AIRCRAFT INSTRUMENT DIVISION

Elgin, Illinois

SAVOIA-MARCHETTI
S-55 FLYING BOAT

American Aeronautical Corporation
Port Washington, Long Island, N. Y.

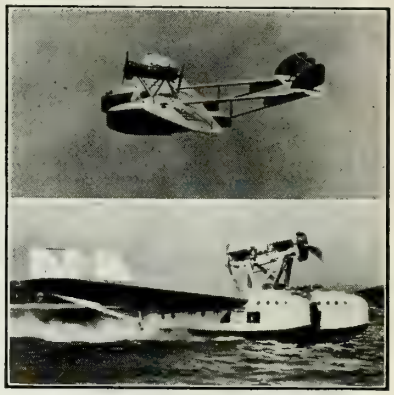
Specifications: Span, 79 feet 11 inches. Length overall, 55 feet 2 inches. Height overall, 16 feet 9 inches. Wing area (including ailerons), 990 square feet. Two engines, Isotta-Fraschini, or Curtiss Conqueror, or Wright Cyclone, totaling 1,000 horsepower. Power loading, 16.1 pounds per horsepower. Wing loading, 17.35 pounds per square foot. Weight empty, 10,600 pounds; useful load, 5,250 pounds; gross weight, 15,850 pounds.



Performance: High speed, 130 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 75 miles per hour. Rate of climb, 400 feet first minute. Climb in 10 minutes, 3,400 feet. Service ceiling, 11,000 feet. Radius, optional. Gasoline capacity, optional.

The Savoia-Marchetti S-55 Flying Boat is provided with twin hulls, each of which accommodates five or six persons. The framework of the hulls is of wood; sides and decks are of plywood, bottom is double planked cedar. The hulls are covered with plywood and fabric. Ailerons and tail surfaces have a framework of steel tubing covered with fabric. Full cantilever wings with a fuselage of wood, covered with plywood and fabric, are provided.

Equipment includes Paragon propeller, compressed air starter, dual controls, Pioneer instrument panel, turn and bank indicator, clock, magnetic compass, inclinometer, navigation, cabin and instrument board lights complete with battery, safety belts, tool kit, first aid kit, anchor, life preservers, fire extinguisher, air speed indicator, altimeter, clock, water thermometer, oil thermometer, gasoline gauge.



AMERICAN EAGLE
EAGLET

American Eagle Aircraft Corporation,
Kansas City, Kansas

Specifications: Span, 34 feet 4 inches. Length overall, 21 feet 6 inches. Height overall, 7 feet 9 inches. Wing area (including ailerons), 164.4 square feet. Szekely SR-3L 30 horsepower. Power loading, 29.2 pounds per horsepower. Wing loading, 5.32 pounds per square foot. Weight empty, 467 pounds; useful load, 400 pounds; gross weight, 867 pounds.



Performance: High speed, 80 miles per hour. Cruising speed, 70 miles per hour. Landing speed, 35 miles per hour. Rate of climb, 600 feet per minute. Service ceiling, 14,500 feet. Radius, 225 miles. Gasoline capacity, 8.5 gallons.

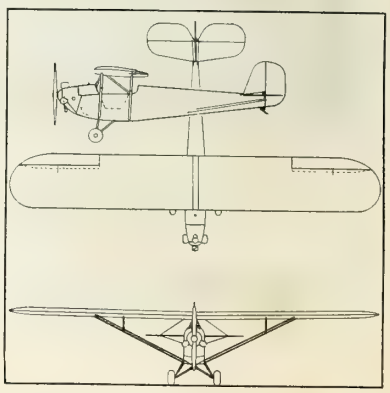
The American Eaglet is a two-place ship. Seating arrangement is in tandem. Dual stick and throttle are provided.

The framework of the fuselage is built of S. A. E. 4130 steel tubing, welded, covered with doped and lacquered linen. The framework of the ailerons is of wood, spars of spruce, linen covered. Wings have conventional framework of wood; spruce spars, drag truss system, spruce compression struts and round tie rods.

Landing gear is the split-axle type, equipped with four Rusco rubber rings for shock absorbers, Goodrich low-pressure or balloon tires.

Propeller is Flotorp. Instrument panel is aluminum alloy with instruments in place. Instruments include altimeter, tachometer, oil pressure gauge, oil temperature gauge, gasoline gauge. Equipment includes switch, choke, gasoline shut-off, Pyrene fire extinguisher, log books and first aid kit.

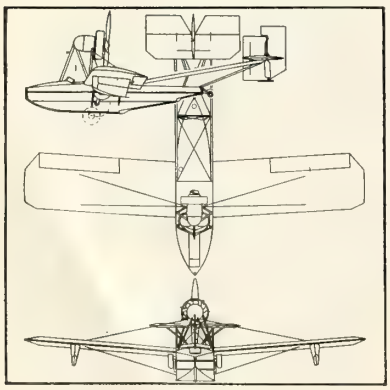
For additional information see advertisement on pages 132, 133 of this issue



AMPHIBIONS
PRIVATEER P-2

Amphibions, Inc.
Garden City, Long Island, N. Y.

Specifications: Span, 38 feet. Length overall, 28 feet. Height overall, 8 feet 4 inches. Wing area (including ailerons), 198 square feet. Power loading, 19.1 pounds per horsepower. Wing loading, 10.6 pounds per square foot. Warner Scarab 110 horsepower. Weight empty, 1,450 pounds; useful load, 650 pounds. Gross weight, 2,100 pounds.

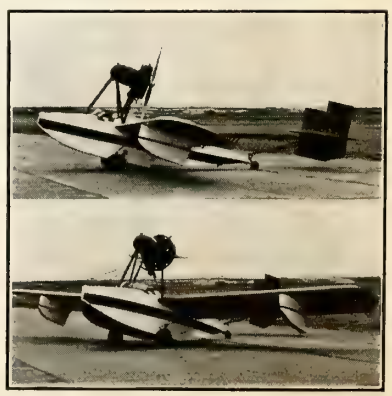


High speed, 95 miles per hour. Cruising speed, 75 miles per hour. Landing speed, 42 miles per hour. Rate of climb, 550 feet per minute. Climb in 10 minutes, 4,500. Service ceiling, 10,000 feet. Radius, 260 miles. Gasoline capacity, 30 gallons.

Bulkheads are of spruce and ash with heavy plywood gussets; longerons are of spruce and ash. Fuselage is semi-monocoque. The covering is of Alclad sheet. Alleghany metal forms the ribs in the ailerons, trailing edge of wings; the nose covering is of Alclad. Tail surfaces are of these two metals and spruce beams. Spruce beams are used in the wings with spruce compression struts and ribs; other ribs are of Alleghany metal. The covering is fabric. The landing gear is semi-cantilever.

The Privateer is equipped with a Paragon or Curtiss Reed metal propeller, Airwheels, Eclipse electric inertia or Heywood starter, Aircraft Products brakes (optional) Pioneer instrument panel. Equipment includes Scintilla magneto switch, fuel flow indicator, Lunkenheimer primer, a 10-pound Navy anchor and 50-foot line, cockpit cover, motor cover. The plane seats two; dual controls are provided.

For additional information see advertisement on page 75 of this issue



THIS WAY TO SALES!



PRIVATEER

LOWEST PRICED AMPHIBION IN THE WORLD

$5,800 . . . . . *Government Approved*

In "PRIVATEER", lowest priced Government Approved amphibion in the world, Amphibions, Inc. presents to dealers a ship designed and priced to please that great group of buyers who are looking for the dual convenience of dependable amphibion performance at minimum cost.

Designed by pioneer makers of amphibions . . . rugged of construction . . . easy to control and service . . . test-flown under every conceivable flying and landing condition . . . the two place open cockpit "PRIVATEER" is the only ship that fits the needs of this great group. Hence, in his territory, the "PRIVATEER" dealer has an unchallenged entry into a vast, untouched market with splendid opportunities for immediate and future profits.

The Amphibions, Inc. dealer policy is fair and liberal. Amphibions, Inc., territorial rights offer unlimited possibilities for present and future business. From those interested in securing a valuable territorial appointment, Amphibions, Inc. invites an investigation of its policies and of "PRIVATEER" performance. For complete information, write or wire

AMPHIBIONS, INC.

GARDEN CITY, NEW YORK

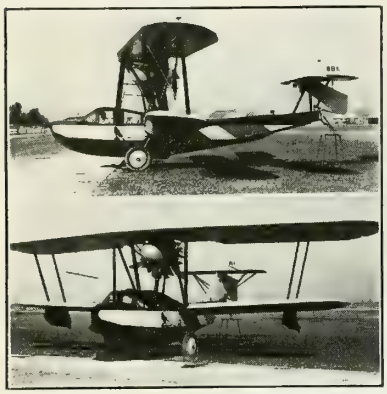
See the "PRIVATEER" at the National Aircraft Show, Detroit, for Details and Demonstration

AMPHIBIONS

NEPTUNE N-2-B and N-2-C

Amphibions, Inc.
Garden City, Long Island, N. Y.

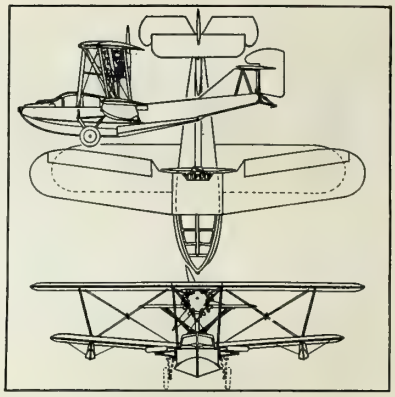
Specifications (Models N2B and N2C, respectively). Span, upper wing, 40; 40 feet; lower wing, 34; 35 feet. Length overall (Model N2C) 31 feet. Height overall (Model N2C) 12 feet 2.5 inches. Wing area (including ailerons), 376; 376 square feet. Power loadings, 14.7; 11.7 pounds per horsepower. Wing loadings, 11.7; 13 pounds per square foot. Wright Whirlwind 300-horsepower; Pratt & Whitney Wasp C 425 horsepower. Weights empty: 2,960; 3,240 pounds. Useful loads, 1,440; 1,660 pounds. Gross weights, 4,400; 4,900 pounds.



Performance: High speeds, 112; 120 miles per hour. Cruising speeds, 80; 95 miles per hour. Landing speeds, 46; 48 miles per hour. Rates of climb, 600; 900 feet per minute. Service ceilings, 14,000; 16,000 feet. Radii, 420; 380 miles. Gasoline capacities, 85; 85 gallons.

Construction of the two models is identical. The fuselage is of welded chrome-molybenum steel tubing with Warren type truss. The covering is Alclad sheet, double riveted at lap seams. Ailerons are Frise type with Alclad ribs formed from sheet and riveted to steel torque tubes. Tail surfaces, except stabilizers, which have spruce beams, are of metal covered with fabric. The wings are constructed of routed spruce beams, spruce and plywood box drag struts, spruce leading edge, Alclad nose covering. Wings are fabric covered.

Propeller is Hamilton-Standard, three bladed. Shock absorbers are of the oleo type. Equipment includes Goodrich tires, Eclipse hand inertia starter, Bendix brakes (optional), standard instruments. Each accommodates four persons, including pilot.

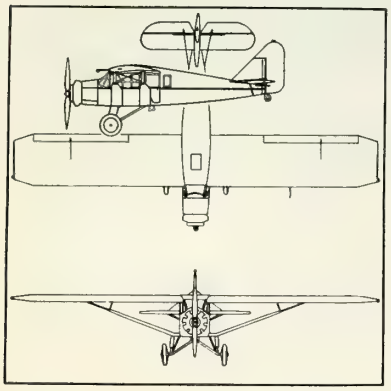


BELLANCA

PACEMAKER

Bellanca Aircraft Corporation
New Castle, Delaware

Specifications: (Whirlwind Nine.) Span, 46 feet 4 inches. Length overall, 27 feet 10.5 inches. Height overall, 8 feet 4 inches. Wright Whirlwind 9 J-6, Series R975 with ring cowl, 300 horsepower. Wing area, 273 square feet. Weight empty, 2,363 pounds; Payload, 1,050 pounds; Gross weight, 4,300 pounds.



Performance: High speed, 150 miles per hour. Cruising speed, 125 miles per hour. Climb at sea level, 900 feet per minute. Service ceiling, 17,000 feet.

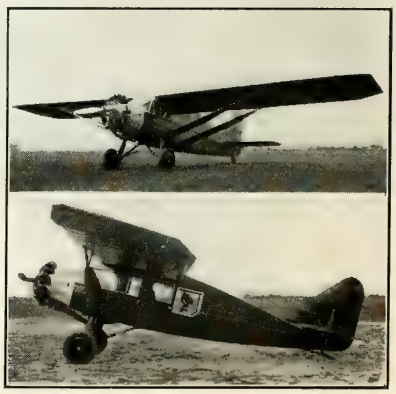
The wings are constructed of spruce spars and ribs of spruce cap strips and basswood webs. The spars are solid, routed. The covering is fabric, attached by rib stitching. Square section tie rods are used for bracing. The entire leading edge of the wing is plywood covered, both top and bottom, as far back as the first spar. The trailing edge is of spruce. The distinctive Bellanca lift struts are used for external wing bracing.

The landing gear is made of heavy-gauge round chrome-molybdenum steel tubing faired with sheet metal. The oildraulic shock absorbing units have a six-inch travel. All joints are fitted with Alemite lubrication.

The Pacemaker, with slightly altered specifications, is also powered with Wasp Junior and Packard Diesel Engines. It has an Approved Type Certificate as a seaplane equipped with Edo floats.

The Pacemaker accommodates six persons including pilots. The seats have frames of steel tubing and are deeply upholstered. The baggage compartment of 12 cubic feet is accessible from rear of cabin or exterior.

For additional information see advertisement on page 79 of this issue



BELLANCA

SKYROCKET

Bellanca Aircraft Corporation
New Castle, Delaware

Specifications: (Landplane and Seaplane, respectively) Span, 46 feet 4 inches; 46 feet 4 inches. Length overall, 27 feet 10 inches; 30 feet 8.25 inches. Height overall, (landplane) 8 feet 4 inches. Wing area, 273; 273 square feet. Wasp C 420 horsepower. Weights empty, 2,592; 3,012 pounds. Payloads, 1,058; 1,038 pounds. Gross weights, 4,600; 5,000 pounds.

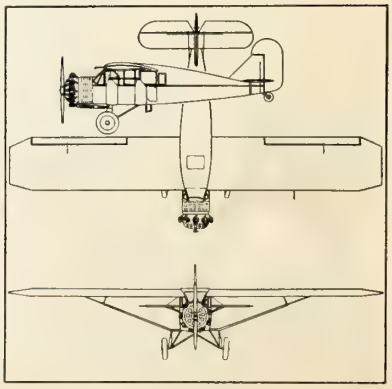


Performance: High speeds, 155; 146 miles per hour. Cruising speeds, 130; 122 miles per hour. Rates of climb, 1,250; 900 feet per minute. Service ceilings, 20,000; 18,000 feet.

The fuselage is of chrome-molybdenum steel tubing throughout and built so as to resist collapse under the severe strain. The cabin is protected on all sides by fuselage members of double construction and extra heavy longerons, made of two steel tubes joined together by a web of steel, solidly welded to the tubes throughout their entire length. The standard Bellanca wing section is used in the wings, which are of two-spar all-wood construction. Solid kiln dried spruce spars are used routed to reduce weight. Ribs are of spruce, bass and balsa wood. The ailerons are of the slot-balanced type. Control surfaces are operated by steel cables which run over ball-bearing micarta pulleys. Construction of the tail surfaces is of steel and wood; fin and rudder being of steel, and stabilizer and elevators of wood.

The landing gear is of round steel tubing, sheet metal faired. Oildraulic shock absorbing units are used. Has A.T.C. with Edo K floats.

For additional information see advertisement on page 79 of this issue





Goodrich LOW PRESSURE TIRES make possible 92 foot take-off on MUDDY FIELD . . .

TAKING OFF from a soggy field that was little better than a mire, on March 6, 1931, famous aviatrix Ruth Nichols soared 28,743 feet above New York City to establish a new women's altitude record.

This event is now a matter of history, but the fact that her plane was equipped with Goodrich *low pressure* Tires is of more than passing interest. Why do so many record-breaking pilots consistently choose this tire? Why, in fact, are more airplanes equipped with Goodrich than any other make?

The blunt answer is this—*Goodrich low pressure Tires are better.* Built with Goodrich Weftless cord—toughened by the famous Goodrich water cure, these tires offer you a greater margin of safety on every take-off and landing.

There is a Goodrich *low pressure* Tire built for every plane—with or without brakes.

Phone your nearest Goodrich dealer or write for further data to the Aeronautical Sales Department of The B. F. Goodrich Rubber Company, Akron, Ohio.

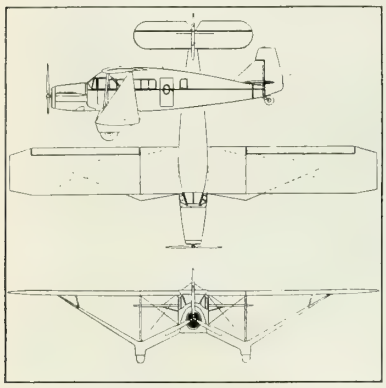


Goodrich RUBBER FOR AIRPLANES

Another B. F. Goodrich *Product*

Over 40 rubber articles for airplanes . . . Silvertown Tires . . . Streamline Windshields
Tail Wheels . . . Hose Tubing . . . Engine Mounts . . . Crash Pads . . . Accessories

Specifications (geared Conqueror and direct Cyclone powered, respectively.) Span, 65; 65 feet. Length overall, 40 feet 8 inches; 42 feet 9 inches. Height overall, 11 feet 6.5 inches; 11 feet 6.5 inches. Wing areas, 652 square feet. Curtiss-Wright Conqueror 600 horsepower and Curtiss Wright Cyclone 575 horsepower. Weight empty, 5,490; 5,155 pounds. Payloads, 2,572; 2,945 pounds.



BELLANCA
AIRBUS
Bellanca Aircraft Corporation
New Castle, Delaware

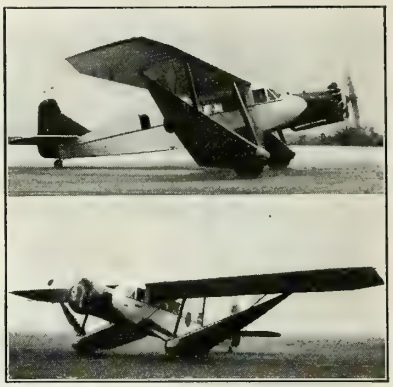
Gross weight, 9,500; 9,590 pounds.

Performance: High speeds, 147; 139 miles per hour. Cruising speeds, 126; 120 miles per hour. Rates of climb, 750; 600 feet per minute. Service ceiling, 16,000; 13,000 feet.

The fuselage is of welded chrome-molybdenum steel tubing with vital members of extremely large size. The rear section is braced by tie rods. The wings are semi cantilever in type. The upper wings are of wood. The lower stub wings and auxiliary wings are built entirely of chrome-molybdenum steel with double tie rods throughout. Covering is of fabric. The lower stub wings form part of the landing gear structure. Low-pressure balloon tires and two oildraulic struts on each wheel are standard equipment. All controls operate on large diameter oil-less bronze hinges. Control bearings are equipped with Alemite lubrication. Slot-balanced ailerons provide lateral control at speeds below stalling.

The Airbus seats 12 persons. Standard equipment includes starter, brakes, navigation cabin and instrument board lights, individual heaters and ventilators to each seat, air speed indicator, bank and turn indicator, rate of climb indicator, clock, magnetic compass, and all engine instruments.

For additional information see advertisement on page 79 of this issue



Specifications: (Powered with Kinner 125 horsepower, Warner 110 horsepower, and Kinner 90 horsepower, respectively). Span, upper wings, 34 feet; lower wing, 25 feet. Length overall, 23 feet. Height overall, 8 feet. Wing area, 266 square feet. Weight empty, 1,350; 1,230; 1,199 pounds. Disposable loads, 985; 790; 781 pounds. Gross



BIRD
KINNER
Bird Aircraft Corporation
Glendale, Long Island

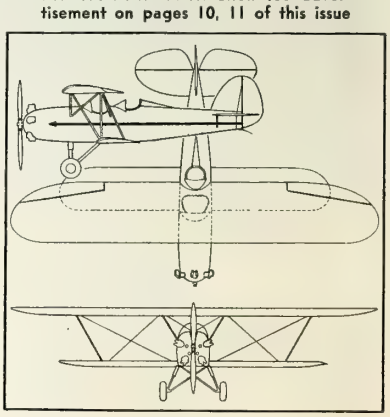
weights, 2,335; 2,020; 1,980 pounds.

Performance: High speeds, 120; 117; 115 miles per hour. Cruising speeds, 100; 98; 95 miles per hour. Landing speeds, 35; 34; 34 miles per hour. Rates of climb, 1,100; 950; 900 feet per minute. Service ceilings, 17,000; 16,500; 16,000 feet.

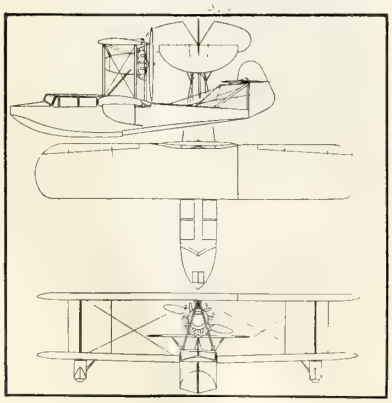
The fuselage is of welded chrome-molybdenum steel tubing in the form of a Warren truss with no wire bracing. The fuselage fittings are slotted into the tubes and welded. The wing structure is built up of spruce spars and compression members, braced with steel tie rods. Ribs are also of wood. The leading edge is covered with duralumin sheet. The wing tips are rounded and tapered. Ailerons are of wood and tail surfaces are of welded steel tubes covered with fabric. The ailerons and elevators are operated by push-pull rods; the rudder is operated by cables. The landing gear is of the split-axle type. Shock absorbers are a combination of oleo and rubber. The tail skid is of the leaf-spring type made of silicon steel mounted on a bronze bearing.

The Kinner 125-horsepower Bird accommodates four people; the other models three people each. A large luggage compartment is provided.

For additional information see advertisement on pages 10, 11 of this issue



Specifications: Span, 39 feet 8 inches. Length overall, 32 feet 6 inches. Height overall, 12 feet. Wing area (including ailerons), 470 square feet. Pratt & Whitney Wasp 425 horsepower. Power loading, 12.2 pounds per horsepower. Wing loading, 10.62 pounds per square foot. Weight empty, 3,358 pounds; useful load, 1,642 pounds;



BOEING
204 FLYING BOAT
Boeing Airplane Company,
Seattle, Washington

gross weight, 5,000 pounds.

Performance: High speed, 133 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 59 miles per hour. Rate of climb, 950 feet per minute. Climb in 10 minutes, 5,500 feet. Service ceiling, 14,000 feet. Gasoline capacity, 80 gallons.

The framework of the hull is constructed of spruce, covered with mahogany plywood. The framework of the wings is constructed of wood; spars are of spruce. The wings are covered with fabric.

A wooden, metal-tipped propeller and an electric inertia starter are provided. Flight, navigation, engine instruments, fuel gauges and anchor are included in the equipment.

The Boeing Flying Boat accommodates six persons, including the crew. A compartment for baggage is provided. The cabin, enclosed in glass, is incorporated in the construction of the hull forward of the wings to give maximum visibility. This ship is a pusher-type biplane. The engine is mounted on a streamlined nacelle which in turn is mounted on rear cabane struts just below the upper wing. A five-gallon oil tank is installed within the nacelle. Fuel is carried in the upper wing. The hull bottom has a straight Vee with a single step under the wing. Baggage is carried in a compartment aft of the cabin.



BELLANCAS WITH SINGLE ENGINES DOUBLE EFFICIENCY AND ASSURE SAFETY OF AIR TRANSPORTATION . . . . .



THE AIRBUS
12 Place; 11 Passengers, Pilot and 1,075 lbs. of Baggage and Cargo.
Fuel sufficient for 700 miles cruising range. Cruising Speed of 120 m.p.h.



The Pacemaker 6-Place Monoplane with Whirlwind 9 - 300 h.p. Engine

The same excellent characteristics are embodied in the Pacemaker and the Wasp-engined Skyrocket, both 6-place, single-engined ships which are known the world over for their extraordinary performance and have earned for Bellanca an unparalleled record for safety and endurance.

PAYLOAD: twice that of other single-engined transport planes of similar horsepower. Consists of 11 passengers and 600 lbs. of baggage and cargo carried in cabin baggage compartment and 450 lbs. in nose compartment. Total, 2,945 lbs.

OPERATING COST: half that of multi-engined airplanes of similar load capacity. The single Cyclone engine is economical to operate. The 200-gal. gasoline capacity provides a cruising radius of 700 miles.

SAFETY: due to that perfection of flying qualities, control, and quiet comfort which only the single-engined airplane provides, as the history of aviation has proved.

THE RESULT: earning capacity far beyond that of any aircraft as yet produced.

All Bellanca Aircraft Manufactured Under Department of Commerce Approved Type Certificates

Write for Literature and Further Information

BELLANCA AIRCRAFT CORPORATION

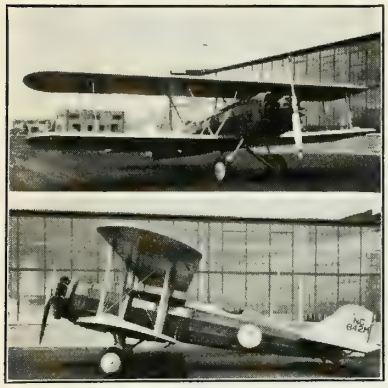
New Castle, Delaware **Chrysler Building, New York**

Bellanca Aircraft of Canada, Ltd., Montreal

BELLANCA

BOEING
40-B4
Boeing Airplane Company, Seattle, Washington

Specifications: Span, 44 feet 2.25 inches. Length overall, 33 feet 4.5 inches. Height overall, 11 feet 8.5 inches. Wing area (including ailerons), 545 square feet. Pratt & Whitney Hornet 525 horsepower. Power loading, 11.57 pounds per horsepower. Wing loading, 11.15 pounds per square foot. Weight empty, 3,809 pounds; useful load, 2,271 pounds; gross weight, 6,080 pounds.



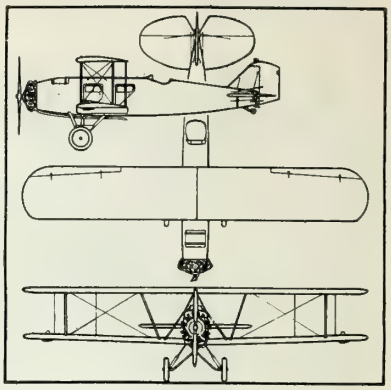
Performance: High speed, 135 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 57 miles per hour. Rate of climb, 800 feet per minute. Climb in 10 minutes, 6,320 feet. Service ceiling, 15,000 feet. Gasoline capacity, 140 gallons.

The framework of the fuselage is constructed of welded steel tubing covered with fabric. The fuselage is especially designed for heavy duty flying. The framework of the wings is constructed of wood, spars of spruce, covered with fabric. The landing gear, built of steel tubing, is of the cross-axle type. Oleo shock absorbers produced by the Boeing company, and hand operated brakes, are provided. Tires are optional. A metal adjustable propeller and electric inertia starter are included in the standard equipment of this ship.

The Boeing 40-B4 is bonded and shielded for radio installation. Accessories include standard landing lights, cabin and cockpit heating system and sound-proofing.

Five persons are accommodated. Seats are arranged in pairs, staggered to allow maximum shoulder room. Baggage compartment is installed at the forward end of the cabin.

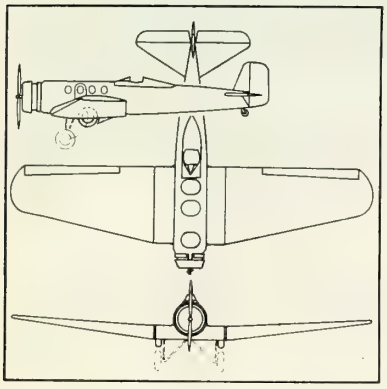
For additional information see advertisement on page 227 of this issue



BOEING
MONOMAIL
Boeing Airplane Company, Seattle, Washington

Specifications: Span, 59 feet 1.5 inches. Length overall 41 feet 2 inches. Height overall, 16 feet. Pratt & Whitney Hornet B 575 horsepower. Weight empty, 4,990 pounds; useful load, 3,010 pounds; gross weight, 8,000 pounds.

Performance: High speed, 158 miles per hour. Cruising speed, 140 miles per hour. Landing speed, 57 miles per hour. Rate of climb, 720 feet per minute. Service ceiling, 14,700 feet. Radius, 500 miles. Gasoline capacity, 135 gallons.

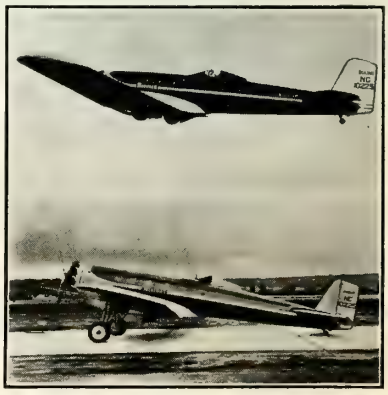


The Boeing Monomail is a low-wing cabin monoplane with the pilot's cockpit aft of the cabin.

A semi-monocoque fuselage is incorporated in the construction of the Boeing Monomail. Duralumin is used throughout in the construction of fuselage, ailerons, tail surfaces and wings. The framework of the fuselage is built of duralumin tubing, bolted. The engine mount is of welded steel tubing. Ailerons, which are of the Frise type, and the tail surfaces are constructed of duralumin. The framework of the wings is built of duralumin spars and ribs. The fuselage and the wings are covered with dural.

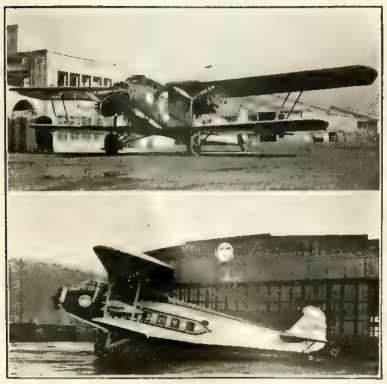
A retractable landing gear, constructed of steel tubing, is provided. The shock absorbers are of the oleo type, and were produced by the Boeing company. The brakes are rod controlled, pedal operated. Tires are optional. A metal adjustable propeller and an electric inertia starter are included in the standard equipment of this ship.

The Boeing Monomail accommodates seven-nine passengers, including crew. Storage space for cargo and mail is provided. Engine, navigation, flight instruments and fuel gauges are provided.



BOEING
80-A TRANSPORT
Boeing Airplane Company, Seattle, Washington

Specifications: Span, upper wing, 80 feet; lower wing, 64 feet 10 inches. Length overall, 55 feet. Height overall, 15 feet 2 inches. Wing area (including ailerons), 1,250 square feet. Three Pratt & Whitney Hornets at 525 horsepower. Power loading, 11.6 pounds per horsepower. Wing loading, 14 pounds per square foot. Weight empty, 10,417 pounds; useful load, 7,083 pounds; gross weight, 17,500 pounds.



Performance: High speed, 138 miles per hour. Cruising speed 115 miles per hour. Landing speed, 55 miles per hour. Rate of climb, 850 feet per minute. Climb in 10 minutes, 5,500 feet. Service ceiling, 14,000 feet. Gasoline capacity, 400 gallons.

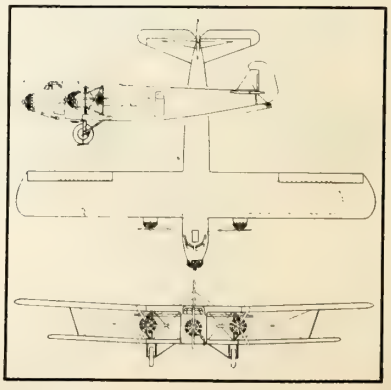
The framework of the fuselage is constructed of welded steel tubing and bolted duralumin tubing, covered with fabric. Ailerons are metal. The framework of the wings is built of dural ribs and spars, fabric covered.

The landing gear is the treadle type double oleo of welded steel tubing. Oleo spring shock absorbers are provided. Tires are optional. Propellers are metal adjustable. There are three electric starters.

The ship is bonded and shielded for radio, Shutter controls to regulate oil temperature, individually controlled fire extinguishers, flight, navigation and complete complement of engine and fuel gauges are provided. Control is dual.

The Boeing 80-A Transport accommodates 21 persons, including crew. Features include hot and cold running water, electric lighting and sound-proofing.

For additional information see advertisement on page 227 of this issue



PIONEER ANNOUNCES 4 NEW PRODUCTS

The Telepoint—
A New Remote Reading Compass

Light weight.
No rotating parts.
Easy to install.
No parts exposed to slipstream.
Can be placed in wing if desired.
Requires practically no servicing.

Drift Meter—Type 625

Light and compact.
Mounts in floor of plane.
Easy to use.
Can be sighted on ground lights at night.

Aircraft Octant—Type 342

Entirely new design—small, compact and rugged.
Observations easy to make.
Optical and moving parts protected.

Aircraft Panel—Type C

Designed for moderate priced planes.
Contains Tachometer, Altimeter, Thermometer and Oil Pressure Gauge.
Indirect electric illumination if desired.
Available in all chrome, or chrome and black finish.



See these products at the National Aircraft Show, or write us for particulars.

PIONEER INSTRUMENT COMPANY

INCORPORATED · · · DIVISION OF BENDIX AVIATION CORPORATION

754 LEXINGTON AVENUE · · · BROOKLYN NEW YORK

308 DEARBORN BLDG., DEARBORN * BENDIX BUILDING, LOS ANGELES * 15 SPEAR ST., SAN FRANCISCO * 420 W. DOUGLAS ST., WICHITA * 5214 W. 63RD ST., CHICAGO
527 SUSSEX ST., OTTAWA * STERNPLATZ 13 JOHANNISTHAL-BERLIN * GENERAL EUROPEAN REPRESENTATIVE, M. CALDERARA, 11 BIS RUE MONTAIGNE, PARIS

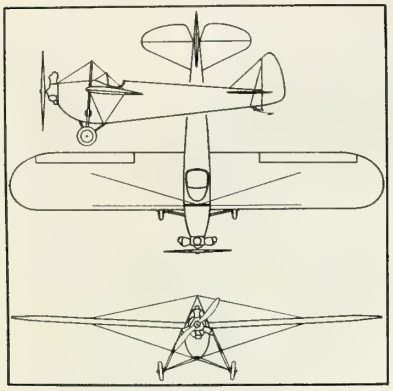
BUHL

BULL PUP LA-1

Buhl Aircraft Company
Marysville, Michigan

Specifications: Span, 30 feet. Wing area (including ailerons), 122 square feet. Power loading, 18.8 pounds per horsepower. Wing loading, 6.9 pounds per square foot. Szekely 45 horsepower. Weight empty, 545 pounds; Useful load, 305 pounds; Gross weight, 850 pounds.

Performance: High speed, 98 miles per hour. Cruising speed, 76 miles per hour. Landing speed, 32 miles per hour. Rate of climb, 800 feet per minute. Service ceiling, 14,000 feet. Radius, 275 miles. Gasoline capacity, 10 gallons.



The fuselage is monocoque in design and is built of duralumin. The wings are of conventional wood and steel construction, fabric covered. Wing fittings and wire pulls are installed inside the wings. The ailerons are dural. The tail surfaces are of metal; the fin is duralumin and is an intergral part of the fuselage. The other tail surfaces are of steel tubing and are fabric covered.

The landing gear is oleo type, utilizing oil to minimize landing shock and shock cord for taxying. The propeller is Flottrop wood with metal tips. Tires are Goodyear, U. S. or Goodrich.

The wings are externally braced with streamline tubing running from cabane struts and from the under side of the body. The air speed pitot tube is attached to the cabane strut beyond the slipstream.

The Bull Pup accommodates one person and 40 pounds of baggage. It has been flown successfully with skis.

The ship will be produced in quantity production with various sizes of wing span

For additional information see advertisement on page 83 of this issue

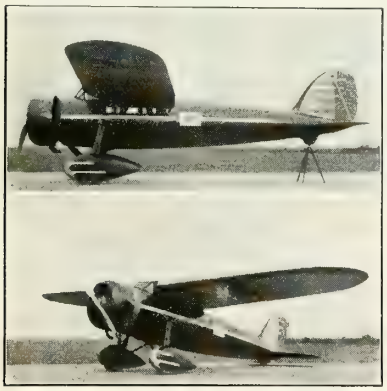


CONSOLIDATED

FLEETSTER 17

Consolidated Aircraft Corporation
Buffalo, New York

Specifications: Span, 45 feet. Length overall, 31 feet 9 inches. Height overall, 9 feet 2 inches. Wing area (including ailerons), 313.5 square feet. Power loading, 9.74 pounds per horsepower. Wing loading, 17.86 pounds per square foot. Hornet B or Cyclone engine of 575 horsepower. Weight empty, 3,443 pounds; useful load, 2,157 pounds; gross weight, 5,600 pounds.



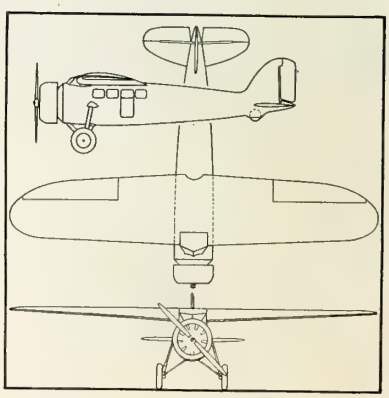
Performance: Height speed, 180 miles per hour. Cruising speed, 153 miles per hour. Landing speed, 60 miles per hour. Rate of climb, 1,100 feet per minute. Climb in 14 minutes, 10,000 feet. Service ceiling, 19,000 feet. Radius, 750 miles. Gasoline capacity, 146 gallons.

The fuselage is all-metal monocoque constructed of duralumin sheet over extruded duralumin longitudinal stringers and extruded duralumin annular rings and bulkheads. The ailerons are of wood construction; the tail surfaces of heat treated duralumin. The wings are of wood with full cantilever construction. The landing gear has oleo shock absorbing struts, 36-inch-by-8-inch tires, disc wheels with wheel brakes and wheel streamlines. The plane is convertible to seaplane operations if desired.

The propeller is metal, adjustable pitch. Equipment includes Eclipse Series 11 combination inertia-electric starter, Bendix brakes and Pioneer transport instrument panel with complete night flying instruments.

The plane accommodates eight persons, including the crew, in either a tandem or chummy seating arrangement. Baggage space comprises 25 cubic feet.

Equipment includes radio shielding.

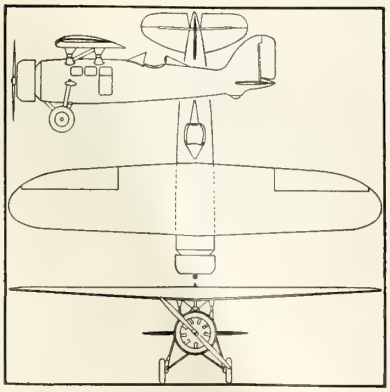


CONSOLIDATED

FLEETSTER 20

Consolidated Aircraft Corporation
Buffalo, New York

Specifications: Span, 45 feet. Length overall, 31 feet 9 inches. Height overall, 10 feet 2 inches. Wing area (including ailerons), 313.5 square feet. Power loading, 10.26 pounds per horsepower. Wing loading, 18.82 pounds per square foot. Hornet B or Cyclone engine of 575 horsepower. Weight empty, 3,439 pounds; useful load 2,461 pounds; gross weight, 5,900 pounds.



Performance: High speed, 175 miles per hour. Cruising speed, 148 miles per hour. Landing speed, 59 miles per hour. Rate of climb, 1,000 feet per minute. Climb in 12 minutes, 10,000 feet. Service ceiling, 17,500 feet. Radius, 700 miles. Gasoline capacity, 146 gallons.

The fuselage is all-metal monocoque, constructed of duralumin sheet, over extruded duralumin longitudinal stringers and extruded duralumin annular rings and bulkheads. The ailerons are of wood construction; the tail surfaces of heat treated dural. The full-cantilver wings are of wood construction. The landing gear is equipped with oleo shock absorbing struts, 32-inch-by-6 6-inch disc wheels with wheel brakes and wheel streamlines.

The propeller is of metal with adjustable pitch. The starter is Eclipse Series 11, combination inertia electric. Brakes are Bendix. A Pioneer Transport panel is used. Weight empty includes starter and generator, propeller, radio shielding, battery, landing lights, seats, complete night flying instrument board. The Fleetster 20 accommodates six persons, including the crew, and allows 55 cubic feet for baggage.

Side-by-side or chummy seating arrangement is provided.

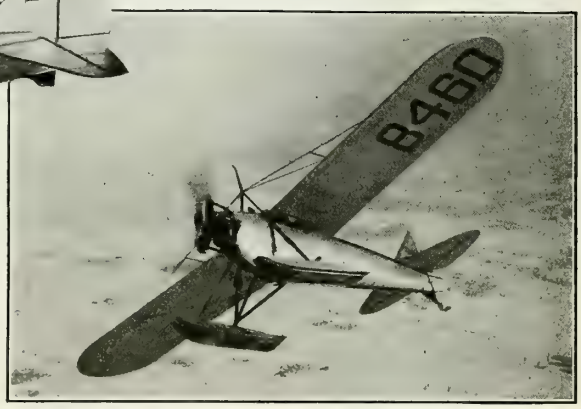


"Flying Bull Pup"

$1250 F.O.F. Marysville



Detroit News Photo



Performance

High Speed at sea level . . . . 98 M. P. H.
Cruising Speed (1,650 R. P. M.) . . 76 M. P. H.
Landing Speed . . . . . 32 M. P. H.
Climb 800 ft. first minute. Service ceiling 14,000 ft.

The "Flying Bull Pup" is Buhl's answer to the universal need for a light individual plane. This sturdy, stable, fool-proof "Flying Bull Pup" is the product of all the engineering ingenuity of the vast Buhl industrial and financial structure. Proven through two years of development — it is offered to the public with the reputation and integrity of the famous Buhl enterprises to back it up.

This "Flying Bull Pup" is a monoplane with an all-metal duralumin monocoque fuselage, powered with a 45 h.p. Szekely 3-cylinder radial engine. Fuselage is standard with a choice of interchangeable wings offering increase in speed—in performance—in safety—*or whatever feature the individual pilot desires.* Safety features such as slow landing, wings with non-stalling and non-spinning qualities, make the "Flying Bull Pup" *safe for anyone to fly.* Here is the best value in a low-priced plane ever offered to the private owner. A safe, high performance ship at only $1,250.00 — with one of the greatest reputations in aircraft building behind it.

A. T. C. No. 405

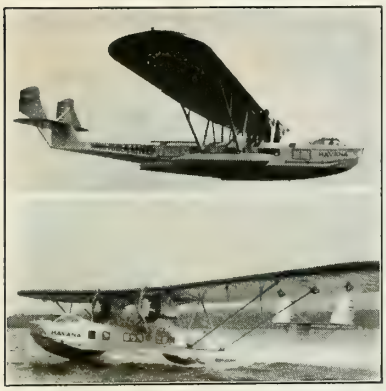
For particulars address Box 819

BUHL Aircraft Company MARYSVILLE MICHIGAN

Buhl

CONSOLIDATED
COMMODORE 16
Consolidated Aircraft Corporation
Buffalo, New York

Specifications: Span, 100 feet. Length overall, 61 feet 6 inches. Height overall, 15 feet 8 inches. Wing area (including ailerons), 1,110 square feet. Two Pratt & Whitney Hornet B's totaling 1,150 horsepower. Power loading, 15.3 pounds per horsepower. Wing loading, 15.85 pounds per square foot. Weight empty, 10,500 pounds; useful load, 7,100 pounds; gross weight, 17,600 pounds.



Performance: High speed, 128 miles per hour. Cruising speed, 108 miles per hour. Landing speed, 55 miles per hour. Rate of climb, 600 feet per minute. Climb in 25 minutes, 10,000 feet. Service ceiling, 10,000 feet. Radius, 1,000 miles. Gasoline capacity, 650 gallons.

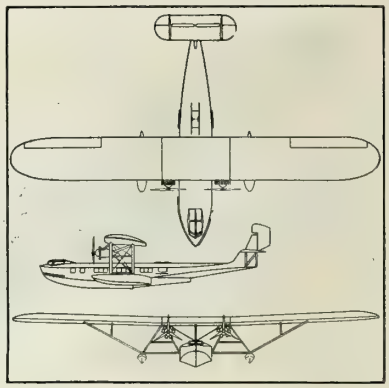
The hull of the Consolidated Commodore Flying Boat is an extruded duralumin structure covered with duralumin sheeting. The ailerons are extruded duralumin structures covered with fabric. Tail surfaces and wings are covered with fabric.

Eclipse combination inertia- electric starter, Pioneer Transport instrument panel and three-bladed metal adjustable pitch propeller of nine feet six inches, are provided.

The Consolidated Commodore accommodates 33 persons and 60 cubic feet of baggage. Compartments have four seats facing forward, four seats facing aft. Controls are dual.

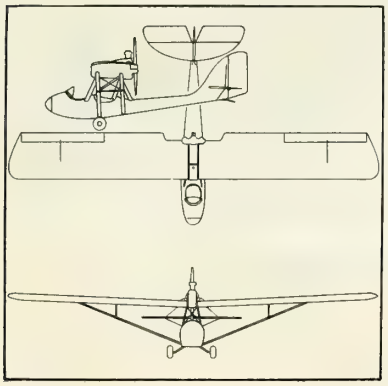
Weight empty includes radio shielding, starter, generator, propellers, battery, landling lights, seats, complete night flying instrument board. Fuel and engine gauges are provided.

For additional information see advertisement on page 85 of this issue



CURTISS-WRIGHT
JUNIOR CW-1
Curtiss-Wright Airplane Co.
Robertson, Missouri

Specifications: Span, 39 feet 6 inches. Length overall, 21 feet 3 inches. Height overall, 6 feet 4 inches. Wing area (including ailerons), 176 square feet. Power loading, 21.2 pounds per horsepower. Wing loading, 5.5 pounds per square foot. Szekely SR3-O of 45 horsepower. Weight empty, 555 pounds; Useful load; 420 pounds; Gross weight, 975 pounds.



Performance: High speed, 80 miles per hour. Cruising speed, 70 miles per hour. Landing speed, 32 miles per hour. Rate of climb, 600 feet per minute. Climb in 10 minutes, 4,250 feet. Radius, 200 miles. Gasoline capacity, 8.5 gallons.

The fuselage is of chrome-molybdenum steel tubing, fabric covered. The ailerons are wood with box spars; they have Frise type balance. Tail surfaces are of chrome-molybdenum steel tubing. The wing, which is secured to the center section by four nickel steel bolts, is built of rectangular solid spruce beams extending from the center section through the wings; ribs are of Hyblum riveted. The entire leading edge of the wing is covered with an aluminum alloy of three-ply birch. The landing gear is cantilever one-piece axle with Airwheels.

The propeller is Flottrop. The instrument panel is equipped with tachometer, oil pressure gauge, oil temperature gauge, altimeter, compass, safety meter. Other accessories are mud guards, tail wheel, cockpit covers, engine cover and propeller cover.

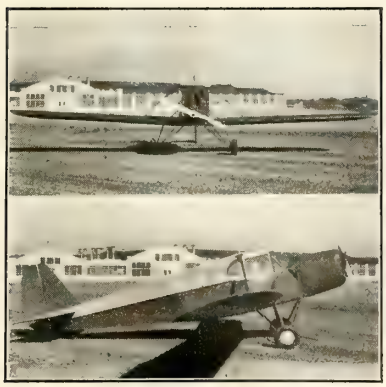
The Curtiss-Wright Junior accommodates two persons in a tandem seating arrangements. Controls are dual.

For additional information see advertisement on page 87 of this issue



CURTISS-WRIGHT
COUPE
Curtiss-Wright Airplane Co.
Robertson, Missouri

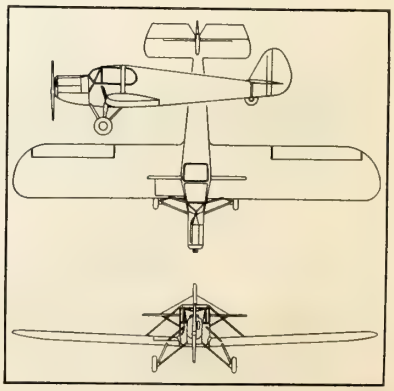
Specifications: Span, 38 feet. Length overall, 25 feet. Height overall, 8 feet. Wing area (including ailerons), 188 square feet. With Kinner B5 125-horseower engine: Power loading, 14.8 pounds per horsepower. Wing loading, 9.6 pounds per square foot. With Curtiss Wright Gipsy 90-horsepower engine: Power loading 19.4 pounds per horsepower. Wing loading, 9.3 pounds per square foot. Weights; With Kinner and Curtiss engines, respectively: Weights empty, 1,242; 1,151 pounds. Useful loads, 608; 599 pounds. Gross weights, 1,850; 1,750 pounds.



Performance (respectively): High speeds, 128; 110 miles per hour. Cruising speeds, 110; 90 miles per hour. Landing speeds, 47; 45 miles per hour. Rates of climb, 950; 600 feet per minute. Climb in 10 minutes, 8,500; 4,500 feet. Service ceilings, 18,000; 14,000 feet. Radii, 400; 450 miles. Gasoline capacities, 30; 30 gallons.

The fuselage is constructed of chrome-molybdenum steel tubing covered with doped fabric. The landing gear has a rather wide tread, and is equipped with hand and service brakes, oleo struts and tail wheel. The propeller is Hartzell. The Coupe is equipped with Aircraft Products shock struts and brakes, Firestone tires or semi-Airwheels, Pioneer instruments including air speed indicator, tachometer, altimeter, oil pressure and temperature gauges, ignition and starter switches, electric gas gauge and switch, and compass. The plane seats two persons with baggage accommodations for 60 pounds. Controls are dual.

For additional information see advertisement on page 91 of this issue



SERVING THE WORLD'S LONGEST AIRLINE



THE COMMODORE

PAN AMERICAN AIRWAYS . . . a 22,000 mile airline spanning 32 countries and colonies of Central and South America, is recognized at home and abroad as the leading independent transport operator of the world ● The high standard of its extensive equipment may be judged by its 1930 record of 99.67% efficiency and regularity of schedule for nearly 7,000,000 miles of flying, with 80,000 passengers, and 580 tons of mail. On its route from Miami, Fla., over the West Indies and the great East Coast Route to Buenos Aires, through service is rendered by a fleet of twenty-passenger, radio-equipped CONSOLIDATED COMMODORE flying yachts, with a cruising range of 1,000 miles at more than 100 miles an hour. From Miami to Cuba, to Kingston, Jamaica, to the Canal Zone, a total of about 1,100 miles, there is one over-water flight of 650 miles ● Transport equipment problems differ only in detail. For heavy duty, or major transport operations wherever there is water, The COMMODORE points the way to profits. In passenger conveniences, spacious, luxurious cabins, wide aisles, and ample headroom, The COMMODORE is unsurpassed. Details of the Commodore's operating economy will be sent on request.



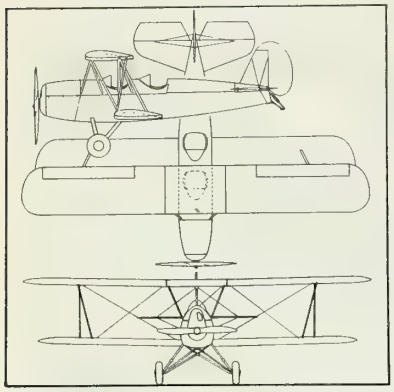




CONSOLIDATED AIRCRAFT CORPORATION · BUFFALO, NEW YORK

CURTISS-WRIGHT
TRAVEL AIR SPORT TRAINER 12Q
Curtiss-Wright Airplane Company
Wichita, Kansas

Specifications: Span, upper wing, 28 feet 10 inches. Length overall, 21 feet 5 inches. Height overall, 8 feet 10 inches. Wing area (including ailerons), 206 square feet. Power loading, 19.1 pounds per horsepower. Wing loading, 8.3 pounds per square foot. Gipsy 90 horsepower. Weight empty, 1,071 pounds; useful load, 654 pounds; Gross weight, 1,725 pounds.



Performance: High speed, 103 miles per hour. Cruising speed, 88 miles per hour. Landing speed, 44 miles per hour. Rate of climb, 600 feet per minute. Service ceiling, 10,000 feet. Radius, 484 miles. Gasoline capacity, 33 gallons.

The fuselage is of conventional welded steel tubing braced throughout by a system of steel tube members. All tubing used is chrome-molybdenum alloy steel. Lionoil is injected into the longerons and the entire structure coated with Armitage Gray Enamel. The engine mount is a detachable unit. Fuselage is metal covered from firewall to pilot's cockpit; other covering is fabric. Ailerons are conventional Frise type. Wings are of conventional wood construction incorporated into a high-lift section, fabric covered. The spars are of spruce; wood-truss type ribs are used.

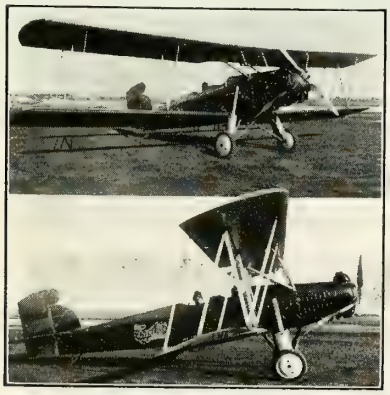
The undercarriage consists of a split-axle wheel chasses and a shock absorbing tail skid. Standard Travel Air oleo-spring shock struts and semi-balloon wheels are used. Shock struts are secured to the structure and vees by means of bronze universal joints. The chassis vees are of chrome-molybdenum steel.

For additional information see advertisement on page 89 of this issue



CURTISS-WRIGHT
FLEDGLING
Curtiss Aeroplane & Motor Co., Inc.
Buffalo, New York

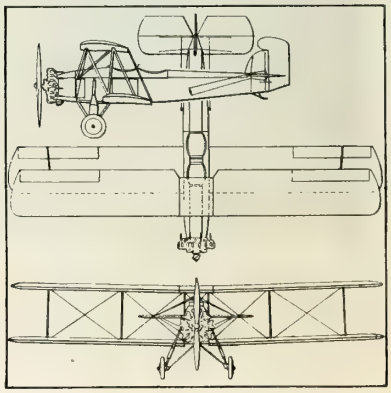
Specifications: Span, upper wing, 34 feet 1 inch; lower wing, 34 feet 5 inches. Length overall, 28 feet 3 inches. Height overall, 10 feet 4 inches. Wing area (including ailerons), 365 square feet. Power loading, 12.3 pounds per horsepower. Wing loading, 8.1 pounds per square foot. Wright Whirlwind 240 horsepower. Weight empty, 2,121 pounds; Useful load, 838 pounds; Gross weight, 2,959 pounds.



Performance: High speed, 115 miles per hour. Cruising speed, 98 miles per hour. Landing speed, 40 miles per hour. Rate of climb, 960 feet per minute. Climb in 10 minutes, 7,350 feet. Service ceiling, 15,200 feet. Radius, 540 miles. Gasoline capacity, 70 gallons.

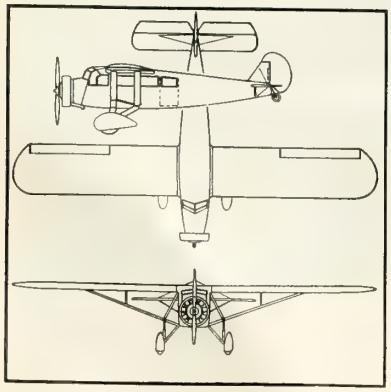
The fuselage is of welded steel tubing, fabric covered. Ailerons and tail surfaces are of welded steel tubing, covered with fabric. Elevators and rudder are balanced. The wings are constructed of spruce spars and ribs, fabric covered. The landing gear is of the split-axle type.

The Fledgling is equipped with a Curtiss Reed propeller, Curtiss shock absorber and Curtis instrument panel. Controls are stick and pedal, the rudder and elevators being actuated by cables and ailerons by independently operated push and pull rods. The stick in the rear cockpit is removable. Seats are adjustable and designed for seat-type parachutes. A baggage compartment is provided aft of the rear cockpit. Good vision is obtained in the Fledgling through excessive stagger and cutout in the center section of the upper wing. Parts requiring inspection are easily accessible and all moving parts are provided with grease or oil fittings.



CURTISS-WRIGHT
TRAVEL AIR 6-B
Curtiss-Wright Airplane Company
Witchita, Kansas

Specifications: Span, 48 feet 6.5 inches. Length overall, 31 feet 5.25 inches. Height overall, 9 feet 3 inches. Wing area (including ailerons), 282 square feet. Power loading, 14.7 pounds per horsepower. Wright Whirlwind 300 horsepower. Weight empty, 2,707 pounds; Useful load, 1,713 pounds; Gross weight, 4,420 pounds.



Performance: High speed, 140 miles per hour. Cruising speed, 115 miles per hour. Landing speed, 60 miles per hour. Rate of climb, 900 feet per minute. Service ceiling, 16,000 feet. Radius, 560 miles. Gasoline capacity, 90 gallons.

The fuselage is of conventional welded steel tubing construction braced with round tie rods in the rear section and with tubing in the forward cabin section. All tubing is of chrome-molybdenum alloy steel. Control surfaces, wings and fuselage fabric covered, with the exception of metal covering from firewall to pilot's cockpit. Ailerons are conventional Frise type of spruce and plywood construction. Tail surfaces have welded steel framework. Rudder is balanced. The wings are of the conventional wood-fabric construction incorporated into a high-lift section. Spars are built-up box type with plywood sides reinforced at all points where fittings attach. Ribs are of the wood truss type; the compression members are of welded steel construction. The landing gear consists of a divided axle wheel chassis and a wheeled tail gear. Pioneer instruments are used. The plane accommodates six persons, including the crew, and 100 pounds of baggage.

For additional information see advertisement on page 93 of this issue



A SHIP THAT FLIES AT TWO CENTS A MILE!

CURTISS-WRIGHT "JUNIOR"



Here's a ship which hops up from a five-acre field . . . climbs 600 feet a minute . . . strikes 80 miles an hour . . . cruises at 70 for hours at a time . . . handles so easily that beginners have mastered it within a day, *yet costs but two cents a mile to fly and a bare $1490 to buy!* ● And the "Junior" asks no favors of you, needs no high-priced pampering, presents no hangar or service problems. Park it out, put it in a shed, it's always ready to up and go. Simple to take off, fly, and land, the "Junior" is a ship that youngsters like. ● Yet it's so sturdily built that finished fliers can loop, dive, do all the tricks, and come out of spins "hands-off"! Due entirely to its pusher type construction, and racy, refined design, the "Junior" offers visibility as clear as from a roadster. Its slow landing speed of 28 m.p.h. and extremely nimble operating ease on or near the ground, make it just the ship for you. ● Developed by aviation's leading engineers, this new plane benefits by all Curtiss-Wright has learned in building its varied, victorious fleet. ● Go to your Curtiss-Wright dealer's. Look the "Junior" over point by point. Get in . . . and fly it yourself!

CURTISS-WRIGHT

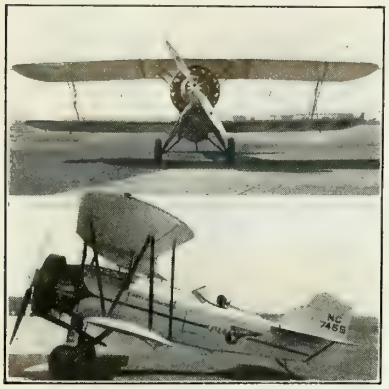
AIRPLANE COMPANY

ROBERTSON, MISSOURI

FACTORIES: ST. LOUIS, MO. WICHITA, KAN.

CURTISS-WRIGHT
FALCON
Curtiss Aeroplane & Motor Co., Inc.
Buffalo, New York

Specifications: Span, upper wing, 38 feet; lower wing, 35 feet. Length overall, 28 feet 3 inches. Height overall, 10 feet 4 inches. Wing area (including ailerons), 351 square feet. Power loading, 11.4 pounds per horsepower. Wing loading, 11.3 pounds per square foot. Wright Cyclone 575 horsepower. Weight empty, 2,940 pounds; Useful load, 1,060 pounds; Gross weight, 4,000 pounds.

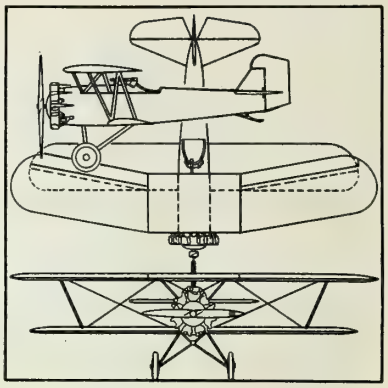


Performance: High speed, 160 miles per hour. Cruising speed, 136 miles per hour. Landing speed, 50 miles per hour. Rate of climb, 1,700 feet per minute. Climb in 10 minutes, 12,500 feet. Service ceiling, 25,300 feet. Radius, 350 miles. Gasoline capacity, 90 gallons—149 gallons maximum.

The fuselage is of riveted duralumin tubing, fabric covered. The ailerons are of duralumin and steel skeleton, fabric covered; they have Frise balance. Tail surfaces are of duralumin skeleton, fabric covered, with balanced elevators and rudder. The wings are constructed of spruce box spars and spruce ribs, fabric covered. Landing gear is of the split-axle type.

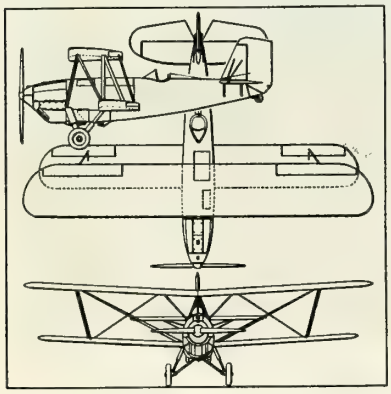
The plane is equipped with Hamilton-Standard propeller, Curtiss oleo shock absorbers, Eclipse starter, Bendix brakes, Curtiss instrument panel, and oxygen equipment. The Falcon accommodates a pilot and 200 pounds of mail. A baggage compartment for the pilot is located aft of the pilot's seat. This airplane was designed especially for high altitude work. A heavier load of mail and fuel can be carried if the maximum ceiling is not required.

This is the same basic model which is used by the military services.



CURTISS-WRIGHT
CARRIER PIGEON II
Curtiss Aeroplane & Motor Co., Inc.
Buffalo, New York

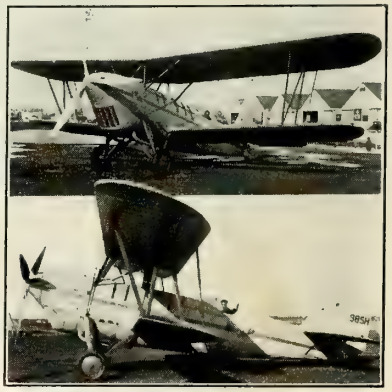
Specifications: Span, upper wing, 47 feet 6 inches; lower wing, 43 feet 6 inches. Length overall, 34 feet 6 inches. Height overall, 13 feet 4 inches. Wing area (including ailerons), 550 square feet. Power loading, 12.7 pounds per horsepower. Wing loading, 13.8 pounds per square foot. Curtiss Conqueror 600 horsepower. Weight empty, 4,300 pounds; Useful load, 3,300 pounds; Gross weight, 7,600 pounds.



Performance: High speed, 150 miles per hour. Cruising speed, 127 miles per hour. Landing speed, 52 miles per hour. Rate of climb, 850 feet per minute. Climb in 10 minutes, 6,400 feet. Service ceiling, 12,200 feet. Radius, 600 miles. Gasoline capacity, 175 gallons.

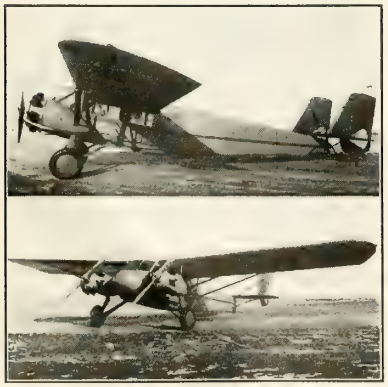
The fuselage is metal monocoque forward and duralumin tubing aft. The covering is fabric. The ailerons are duralumin skeleton, fabric covered, with Frise balance. Tail surfaces are of duralumin, channel spars and ribs, fabric covered. Wings are constructed of spruce box spars, spruce ribs, fabric covered. A split-axle type landing gear is used.

The Carrier Pigeon is equipped with Curtiss Reed three-bladed propeller, Curtiss oleo and rubber shock absorbers, Eclipse hand and electric inertia starter, Bendix brakes, and Curtiss instrument panel. A complete set of instruments including compass and clock is provided. Other accessories are landing lights, parachute flares, and cockpit heater. The ship accommodates pilot and 2,000 pounds of mail. A baggage compartment is provided for the pilot aft of the pilot's seat which is constructed to accommodate a parachute.



CURTISS-WRIGHT
KINGBIRD D-2
Curtiss-Wright Airplane Co.
Robertson, Missouri

Specifications: Span, 54 feet 6 inches. Length overall, 34 feet 10 inches. Height overall, 10 feet. Wing area (including ailerons), 405 square feet. Power loading, 10.6 pounds per horsepower. Wing loading, 15.7 pounds per square foot. Two Wright R-975 Whirlwinds at 300 horsepower. Weight empty, 4,280 pounds; Useful load, 2,080 pounds; Gross weight, 6,360 pounds.

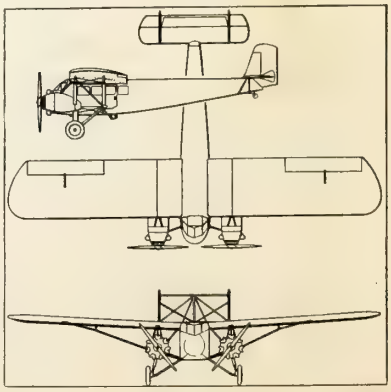


Performance: High speed, 135 miles per hour. Cruising speed, 115 miles per hour. Landing speed, 60 miles per hour. Rate of climb, 1,000 feet per minute. Climb in 10 minutes, 9,000 feet. Service ceiling, 18,000 feet. Radius, 415 miles. Gasoline capacity, 120 gallons.

The fuselage is constructed of dural and steel tubes and fittings, riveted and welded. The covering is fabric, sewed and tacked. The ailerons and tail surfaces have Alclad ribs and duralumin beams, riveted, and sewed fabric cover. The wings have welded and heat treated steel beams with duralumin tube riveted ribs. The landing gear is of welded and heat treated steel with split axle. Wheels and brakes are Bendix; the shock unit is oleo. The propeller is Hamilton-Standard. Electric starters are provided. The instrument panel is equipped with air speed indicator, climb indicator, bank and turn indicator, luminous clock, tachometer, oil pressure gauge, two micro-ignition switches, one emergency switch, compass. Cabin heaters are provided.

The Kingbird accommodates eight persons, including the crew. Provision is made for 210 pounds of baggage. The controls are dual.

For additional information see advertisement on page 213 of this issue



NIMBLE FOR SPORTSMEN

SIMPLE FOR STUDENTS!

TRAVEL AIR

SPORT-TRAINER



Racy and rugged for sportsmen, sturdy and stable for students, the sleekly stream-lined new TRAVEL AIR *Sport-Trainer* is a striking example of the benefits you gain in a ship built by the biggest builders of many types of planes. ● For this latest TRAVEL AIR model offers any number of new developments in stability, handling and servicing ease, and smart, sporty looks, which can be effected only when an organization builds for the whole field. ● You'll like the *Sport-Trainer's* clean-cut lines, its smooth sure speed of over 100 miles an hour, and its cruising range of better than 500 miles. ● For this sturdy ship is so nimble getting off the ground or floating back, so stable in the air, that it's indeed the sportiest of ship's to fly. ● Powered with the world-famous Wright-Gipsy engine, equipped with a remarkable development in full tread, shock-absorbing landing gear plus brakes, the Sport-Trainer is designed in every detail to make flying not only simple but inexpensive. See this TRAVEL AIR at your Curtiss-Wright dealer's now. Compare its value! Fly it on your own!

CURTISS-WRIGHT

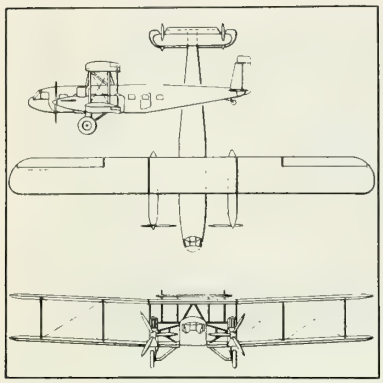
AIRPLANE COMPANY

ROBERTSON, MISSOURI

FACTORIES: ST. LOUIS, MO. WICHITA, KAN.

CURTISS-WRIGHT
CONDOR B-20
Curtiss Aeroplane & Motor Co., Inc.
Buffalo, New York

Specifications: Span, upper wing, 91 feet 8 inches: lower wing, 91 feet 8 inches. Length overall, 57 feet 6.5 inches. Height overall, 16 feet 5 inches. Wing area (including ailerons), 1,512 square feet. Power loading, 11.8 pounds per horsepower. Wing loading, 14.9 pounds per square foot. Engines, two Curtiss Conquerors totaling 1,200 horsepower. Weight empty, 11,818 pounds; Useful load, 6,041 pounds; Gross weight, 17,859 pounds.



Performance: High speed, 140 miles per hour. Cruising speed, 120 miles per hour. Landing speed, 50 miles per hour. Rate of climb, 870 feet per minute. Climb in 10 minutes, 6,950. Service ceiling, 17,000 feet. Radius, 500 miles, normal; 770 miles with maximum fuel. Gasoline capacity, 278 gallons, normal; 444 gallons, maximum.

The fuselage is of steel and duralumin tubing with fabric covering. The ailerons are of duralumin skeleton, fabric covered; they employ the Frise type balance. The tail surfaces are of duralumin and steel skeleton. The wings are of welded steel tubing with Warren truss spars and riveted duralumin tube ribs. The covering is fabric.

The propeller is Curtiss-Reed; shock absorbers are Curtiss oleo with spring. The plane is equipped with 54-inch by 12-inch tires, Eclipse electric and hand inertia starter, Bendix brakes and Curtiss instrument panel with complete dual set of instruments. The plane is completely equipped for passenger transport service, accommodating 21 persons, including the crew, 540 pounds of baggage and 300 pounds of mail. The passenger seats are arranged in three compartments.



DAVIS
D1
Davis Aircraft Corporation,
Richmond, Indiana

Specifications: Span, 30 feet 3 inches. Length overall, 19 feet 10 inches. Height overall, 7 feet. Wing area (including ailerons), 145 square feet. Models D1-60; 70; 85; and K, respectively, powered with LeBlond 65 horsepower, LeBlond 75 horsepower, LeBlond 85 horsepower and Kinner 100 horsepower. Power loadings, 20; 20; 16.2; 14.6 pounds per horsepower. Wing loadings, 9.1; 9.1; 9.5; 10.1 pounds per square foot. Weights empty, 839; 839; 854; 925 pounds. Useful loads, 495; 495; 526; 536 pounds. Gross weights, 1,334; 1,334; 1,380; 1,461 pounds.

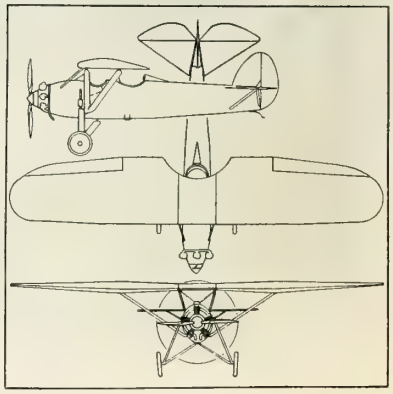


Performance: High speeds, 98; 105; 115; 125 miles per hour. Cruising speeds, 85; 90; 100; 105 miles per hour. Landing speeds, 38; 38; 38; 40 miles per hour. Rates of climb, 600; 650; 800; 1,000 feet per minute. Climb in 10 minutes, 5,000, 5,500; 6,500; 8,000 feet. Service ceilings, 10,000; 11,000; 13,000; 14,000 feet. Radii, 300 miles for each ship. Gasoline capacities, 20; 20; 20; 25 gallons.

The fuselage is of 1025 S. A. E. welded steel tubing and chrome-molybdenum covered with fabric. The framework of the wing is built of duralumin ribs, leading edge with laminated spruce spars, routed, and welded steel center section.

Split-axle type landing gear is provided. Propeller is Flottorp, wooden. Instrument panel is Consolidated A. Two passengers and 25 pounds of baggage are accommodated.

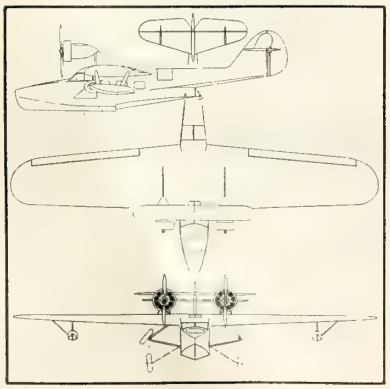
Shock absorbers are rubber shock cord (oildraulic extra). Tires are 26-inch by 4-inch balloon (6.50-inch by 10-inch balloon tires are extra. Controls are dual.



DOUGLAS
DOLPHIN AMPHIBION
Douglas Aircraft Company, Inc.,
Santa Monica, California

Specifications: Wing area (including ailerons), 565 square feet. Two engines with a total of 600 horsepower. Power loading, 13 pounds per horsepower. Wing loading, 13.8 pounds per square foot. Weight empty, 5,400 pounds; useful load, 2,400 pounds; gross weight, 7,800 vounds.

Performance: High speed, 136 miles per hour. Cruising speed, 108 miles per hour. Landing speed, 60 miles per hour. Rate of climb, 700 feet per minute. Service ceiling, 14,000 feet. Radius, 650 miles. Endurance, 6 hours. Gasoline capacity, 180 gallons.



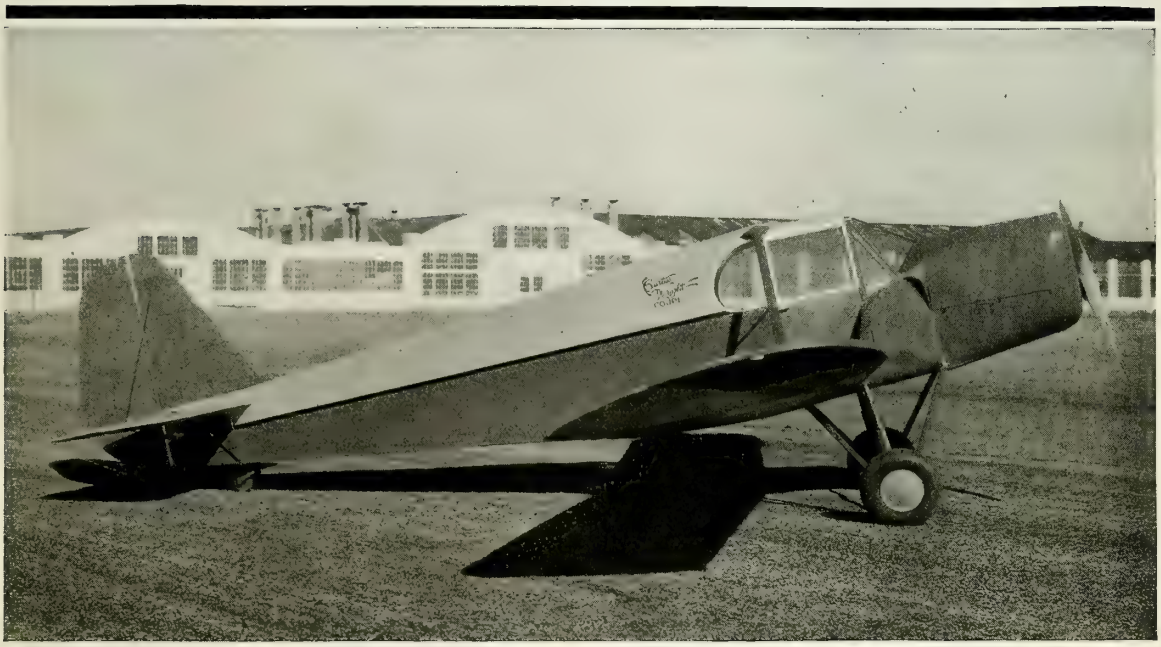
The hull is of dural construction throughout and is divided by bulkheads into six watertight compartments. In the nose of the hull is a compartment separated from the forward baggage compartment by a watertight bulkhead forward of the hatch cover. Access to this compartment is through a manhole which has a cover held in place by machine screws. The Clark Y monoplane wing is of full cantilever construction. Wing spars are of tapered box construction of laminated spruce. Wing ribs are of spruce, truss type, and the fittings are of chrome-molybdenum steel. Spruce veneer covering is used on wings.

The landing gear is of the aero strut type fitted with hydraulic retracting mechanism and Bendix brakes. Six adjustable chairs with head rests are installed in the cabin. There are six large windows, the center window on each side being removable. The baggage compartment contains 30 cubic feet of space. Hamilton-Standard propeller is provided.

For additional information see advertisement on page 183 of this issue



A SNUG AND COZY CLOSED PLANE THAT'S ECONOMICAL TO FLY . . !



Curtiss-Wright's new COUPE is a strikingly streamlined, low wing monoplane, that makes flying cross-country in seats side-by-side just as cozy as a car at a cost approximately the same. ● Its world-famed Wright-Gipsy engine of 90 h. p. gives you power and speed galore. It takes off and lands lightly on the roughest, toughest fields. For shocks are smoothly absorbed by its oleo struts, its semi-balloon wheels mounted on a wide, solid landing gear. ● The COUPE'S cabin is smartly finished with deep upholstery. Protected from wind, weather, and noise you speed in the COUPE at 110 m. p. h. . . . cruise at 90 for 500 miles or more . . . enjoy perfect visibility on all sides from your roomy and completely equipped interior. ● Then there's the added satisfaction of handling a ship so sturdily built, so simple to control, that it's one of the easiest in the world to fly. ● To appreciate fully what Curtiss-Wright engineers have accomplished in producing this rugged, refined little plane, to sense its sporting performance, its economy of 15 miles to a gallon of gas, go to your Curtiss-Wright dealer's right now. Get in this ship and see for yourself! Comparison is the best test.

CURTISS-WRIGHT

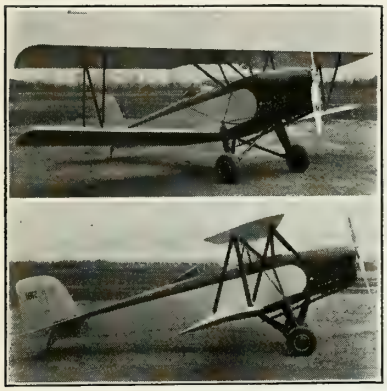
AIRPLANE COMPANY

ROBERTSON, MISSOURI

FACTORIES: ST. LOUIS, MO. WICHITA, KAN.

DRIGGS
SKYLARK
Driggs Aircraft Corporation
Lansing, Michigan

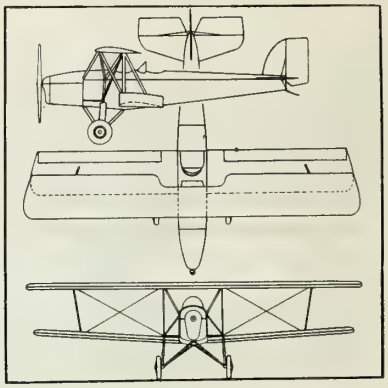
Specifications: Span, upper wing, 28 feet 3 inches; lower wing, 27 feet. Length overall, 22 feet 6 inches. Height overall, 8 feet 3 inches. Wing area (including ailerons), 185 square feet. Power loading, 18.3 pounds per horsepower. Wing loading, 7.34 pounds per square foot. Rover 75 horsepower. Weight empty, 878 pounds. Gross weight, 1,378 pounds.



Performance: High speed, 105 miles per hour. Cruising speed, 85 miles per hour. Landing speed, 40 miles per hour. Rate of climb, 615 feet per minute. Radius, 300 miles.

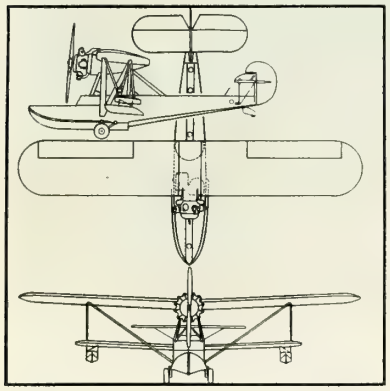
The fuselage is of chrome-molybdenum steel tubing. It is fabric with the exception of the afterdeck, which is metal. The ailerons and tail surfaces are of duralumin, and are controlled by rods. The upper wing is in three sections, the lower in two, making for ease of replacement and shipping. The wing ribs are stamped from aluminum alloy. The ailerons are Frise type; the stabilizer is adjustable. The landing gear is wide and axle-less with 10-inch travel oleo struts. The tires are Goodrich.

The propeller is Hartzell; shock absorbers are Aircraft Products. The instrument panel is Pioneer and mounts an altimeter, tachometer, oil pressure and oil temperature gauge. A gasoline gauge is suspended from the center section in which the tank is located. Head pads are provided on instrument boards. Wings are wired for navigation lights. Controls are dual. Alemite fittings are furnished on both ship and engine for convenience in greasing moving parts. The Skylark accommodates two persons in a tandem seating arrangement.



EASTMAN
AMPHIBION E-2-A
Detroit Aircraft Corporation
Detroit, Michigan

Specifications: Span, 36 feet. Length overall, 26 feet 3 inches. Height overall, 8 feet 9 inches. Wing area (including ailerons), 243 square feet. Curtiss Challenger 185-horsepower. Power loading, 14.75 pounds per horsepower. Wing loading, 11.15 pounds per square foot. Weight empty, 1,970 pounds; gross weight, 2,725 pounds.



Performance: High speed, 102 miles per hour. Cruising speed, 80 miles per hour. Rate of climb, 550 feet per minute. Service ceiling, 9,000 feet. Radius, 350 miles. Gasoline capacity, 48 gallons.

The hull is constructed of Alclad metal around waterproof bulkheads of wood. Plates are bolted throughout. Ailerons and tail surfaces are conventional, ailerons being operated by cables. The wing framework is of wood, built of conventional box spar, spruce ribs, covered with sewed fabric.

Equipment includes oleo struts, Heywood starter, wheels 20 inches by six inches, Hamilton-Standard propeller.

The Eastman Flying Boat has the same construction and performance as the Eastman Amphibion with the following exceptions: weight empty, 1,745 pounds; high speed, 110 miles per hour; service ceiling, 10,000 feet.

The amphibion accommodates three persons, seated one in front, two rear. The flying boat accommodates four persons, seated two each in tandem. Controls on both models are dual. The engine is mounted on the center section of the wings forward of the leading edge, the nacelle being faired into the panel. The water rudder is interconnected with the air rudder.



EMSCO
MID-WING SPORT B-7
Emsco Aircraft Corporation,
Downey, California

Specifications: Span, 36 feet. Length overall, 23 feet, 9 inches. Wing area (including ailerons), 194 square feet. Power loading, 12.71 pounds per horsepower. Wing loading, 10.81 pounds per square foot. Wright J-6-R540 of 165 horsepower; or Curtiss Challenger, 170 horsepower; or Continental A-70, 165 horsepower. Weight empty, 1,492.5 pounds. Useful load, 607.5 pounds. Gross weight, 2,100 pounds.



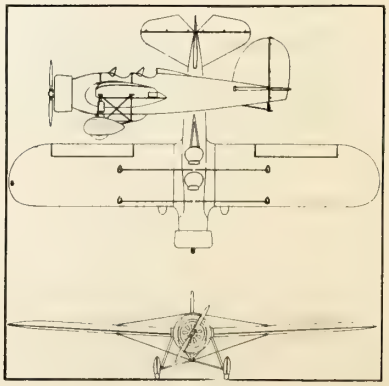
Performance: High speed, 130 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 40 miles per hour. Rate of climb, 1,200 feet per minute. Climb in 10 minutes, 8,000 feet. Service ceiling 18,000 feet. Radius, 350 miles. Gasoline capacity, 32 gallons. The absolute ceiling of the B-7 is 25,000 feet.

The fuselage of welded steel tubing, fabric covered, is faired to elliptical shape. Ailerons are wood, fabric. The tail surfaces are of steel tubing, the wings of wood spars and ribs; both are fabric covered. The landing gear, constructed of steel tubing, is of the split-axle type.

The Mid-wing Sport is equipped with a Hamilton-Standard propeller, adjustable pitch, Aerol shock absorbers, Eclipse direct hand cranking starter; Bendix wheels and brakes and standard instruments. Tires are 24 inch by 4 inch. A first aid kit and portable fire extinguisher are standard equipment with this ship.

The baggage compartment accommodates 40 pounds. The plane accommodates two persons in a tandem seating arrangement. Dual controls are provided.

For additional information see advertisement on page 160 of this issue



BEAUTY IN EVERY LINE
PERFECTION IN PERFORMANCE!

CURTISS·WRIGHT
SEDAN



Offering all the strength and stamina of the world-famous maker and breaker of records for endurance, the striking new Curtiss-Wright SEDAN is a cabin monoplane for four that's as smart as it's sturdy, as racy as it's reliable. ● For into this luxurious foursome flier Curtiss-Wright's engineering staff at Wichita has incorporated devices and ideas developed in years of research and production of practically every type of plane that flies. ● Powered with either a Challenger engine, of endurance fame, a 210 horsepower Kinner, or the world-proved "Whirlwind 240," this remarkable new SEDAN has repeatedly proved its ability to out-climb, out-ride, and completely out-maneuver plane after plane put up as its match in size, type, power, or price. ● In snug comfort you relax, revel in the SEDAN'S luxurious furnishments and roominess, while this stable, smooth-riding ship *makes each minute mean nearly two miles for 500 miles at a stretch.* ● With every feature of comfort for passengers, with every convenience for the pilot, built to stand rough going aground and hard usage aloft, this new Curtiss-Wright enclosed ship is the plane you'll be proud to own. Go and see the SEDAN at your nearest Curtiss-Wright dealer's now. Get in and try it. You'll want to sail it away!

CURTISS-WRIGHT
AIRPLANE COMPANY
ROBERTSON, MISSOURI

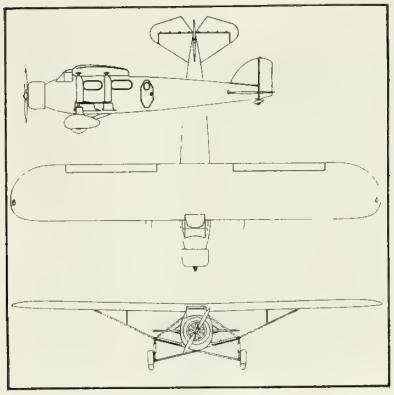
FACTORIES: ST. LOUIS, MO., WICHITA, KAN.

EMSCO

B-3A

Emsco Aircraft Corporation, Downey, California

Specifications: Span, 56 feet. Length overall, 40 feet, 9.5 inches. Height overall, 11 feet 5 inches. Wing area (including ailerons), 486 square feet. Power loading 14.65 pounds per horsepower. Wing loading, 13.60 pounds per square foot. Pratt & Whitney Wasp C of 420 horsepower. Weight empty, 4,199 pounds. Useful load, 2,401 pounds.



Gross weight, 6,600 pounds.

Performance: High speed, 150 miles per hour. Cruising speed, 120 miles per hour. Landing speed, 50 miles per hour. Rate of climb, 800 feet per minute. Climb in 10 minutes, 8,000 feet. Radius, 750 miles. Gasoline capacity, 140 gallons.

The fuselage is of welded steel tubing, covered with fabric and faired to elliptical shape. The ailerons are of wood, fabric covered; tail surfaces are of steel tubing covered with fabric. Wings are constructed of wood spars and ribs, fabric covered. Landing gear is constructed of steel tubing and is of the split-axle type. The wheel streamlines are built up of wood and covered with fabric.

The B-3A is equipped with Hamilton-Standard propeller of adjustable pitch, Gruss air springs, Eclipse electric starter and Bendix brakes. The instrument panel is fitted with standard instruments. First aid kit and two portable fire extinguishers are furnished as standard equipment.

The plane accommodates nine persons, including the crew, seats being arranged on both sides of the central aisle. Baggage compartments carry 150 pounds. Dual controls are provided.

For additional information see advertisement on page 161 of this issue

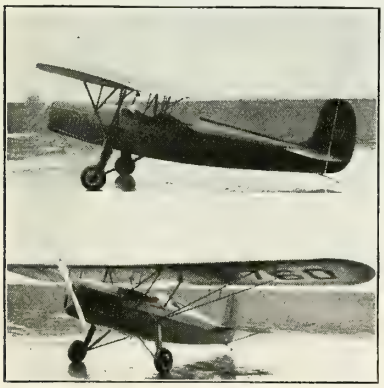


FAIRCHILD

22

Kreider Reisner Aircraft Corporation Hagerstown, Maryland

Specifications: Span, 32 feet 10 inches. Length overall, 22 feet. Height overall, 8 feet. Wing area (including ailerons) 170 square feet. Wing loading, 8.2 pounds per square foot. Power loading, 17.5 pounds per horsepower. Rover four-in-line inverted 80-horsepower. Weight empty, 870 pounds. Useful load, 530 pounds (Consisting of 126 pounds of gasoline, 16 pounds of oil, 48 pounds of baggage, 340 pounds pilot and passenger); Gross weight, 1,400 pounds.

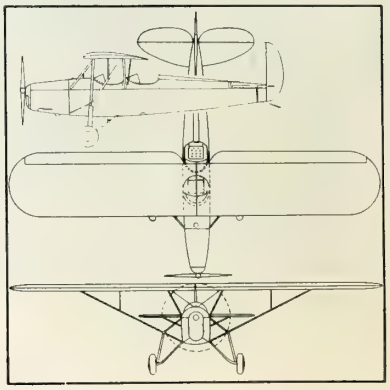


Performance: High speed, 107 miles per hour. Landing speed, 45 miles per hour. Rate of climb, 650 feet per minute. Service ceiling, 9,600 feet. Absolute ceiling, 11,500 feet. Gasoline capacity, 21 gallons.

The fuselage is tubular steel construction. The wings are of wood. The ailerons are duralumin. The plane is equipped with breaks, semi-Airwheels, hydraulic shock absorbers with eight inch movement. The tread of the landing gear is seven feet seven inches. Instruments provided include air speed meter, altimeter, tachometer, oil pressure and oil temperature gauges, switch, gasoline gauge, stabilizer adjustment in both cockpits. Dual controls are provided. Heater, choke control and gas shut-off cock are provided. Pyrene and first aid kit are standard equipment. Both cockpits are equipped with parachute type seats. Each cockpit is 27 inches wide and 32 inches long.

Goodrich tires are provided. The propeller is 80 inches in diameter. The Fairchild 22 accommodates two people, including the pilot.

For additional information see advertisement on page 169 of this issue

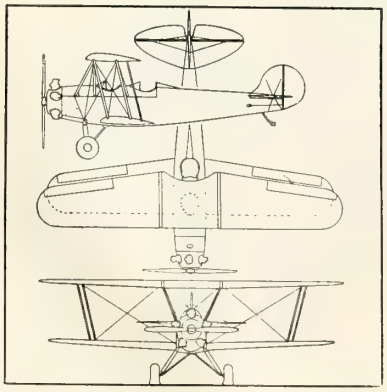


FAIRCHILD

KR-21 AND KR-21B

See news items on pages 202 and 204 for information regarding manufacturer

Specifications: Span, upper wings, 27 feet; lower wings, 24 feet 6 inches. Length overall, 21 feet. Height overall, 8 feet 6 inches. Wing area (including ailerons), 192.6 square feet. (Models KR-21, KR-21B, respectively) Power loadings, 16.35; 13.84 pounds per horsepower. Wing loadings, 8.52; 9.02 pounds per square foot. Kinner K-5 of 100 horsepower; Kinner B-5 of 125 horsepower. Weights empty, 1,068; 1,120 pounds. Useful loads, 535; 610. pounds. Gross weights, 1,603; 1,730 pounds.



Performance: High speeds, 106; 115 miles per hour. Cruising speeds, 91; 92.5 miles per hour. Rate of climb, 530; 720 feet per minute. Climb in 10 minutes 4,250; 5,850 feet. Service ceilings, 10,400; 11,000 feet. Radii, 345, 400 miles. Gasoline capacities, 23; 30 gallons.

The fuselage of the two models is made of welded steel tubing, as are the tail surfaces and landing gear. The ailerons and wings are of wood, fabric covered. Both models are equipped with oleo springs, Goodyear Airwheels or Aircraft Products tires, brakes, booster magnetos, and an instrument panel with air speed meter, altimeter, compass, oil temperature and pressure gauge, and tachometer. The KR-21 is equipped with a Hartzell wood propeller and the KR-21B with a Hamilton-Standard propeller. Each model accommodates two persons in a tandem seating arrangement. Dual controls are provided. Tapered wings are a feature of these models.

The KR-21 is especially designed to meet the demand for a small two-place ship suitable for sport flying or for training purposes.



The Keynote of Flying—

SAFETY!



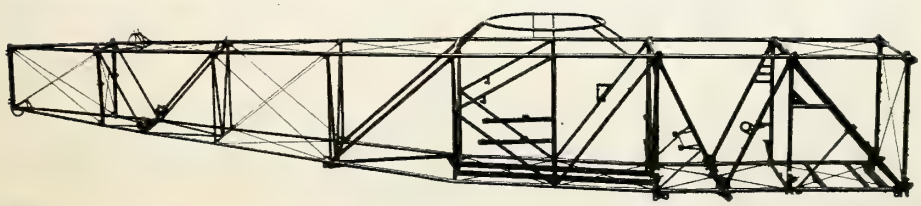
Flawless integrity in the tubing that goes into its construction, down to the smallest member of its framework, is the first requisite of safety in an airplane. All the skill of designers and builders may go for naught if their materials fail them—the rigidity, tautness, and fine balance for which they have provided must all depend on the staunchness of the tubular frame.

NATIONAL-SHELBY Aircraft Tubing is subjected to the most searching tests and inspections and is both physically and chemically made to conform to United States Army and United States Navy Specifications. Long years of experience in the production of tubes for automotive and other purposes prepared the manufacturers of NATIONAL Tubing to meet the highly exacting demands of aircraft design as they arose. From the start of the new industry neither time nor effort has been spared in fulfilling its every requirement.

NATIONAL-SHELBY Aircraft Tubing is available through distributors at important centers in every part of the United States. Descriptive literature will be mailed upon request.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

US STEEL



NATIONAL-SHELBY AIRCRAFT TUBING

FAIRCHILD
KR-34C AND KR-34D

See news items on pages 202 and 204 for information regarding manufacturer

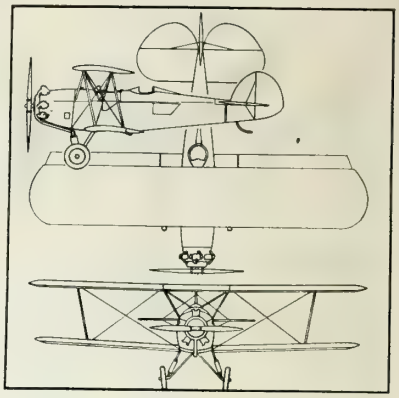
Specifications: Span, upper wing, 30 feet; lower wing, 28 feet 9 inches. Length overall, 23 feet 2 inches. Height overall, 8 feet 9 inches. Wing area (including ailerons), 281 square feet. Power loading, 14.20 pounds per horsepower. Wing loading, 8.34 pounds per square foot. (Models KR-34C, KR-34D, respectively) Wright R540 of 165 horsepower; Comet 7-E of 165 horsepower. Weights empty, 1,524; 1,515 pounds. Useful loads, 844; 855 pounds. Gross weights, 2,368; 2,370 pounds.



Performance: High speeds, 121; 122 miles per hour. Cruising speeds, 97; 97 miles per hour. Rates of climb, 655; 703 feet per minute. Climb in 10 minutes, 5,350; 5,830 feet. Service ceilings, 13,900; 15,200 feet. Radii, 425; 430 miles. Gasoline capacities, 45; 45 gallons.

The two models have identical construction. The fuselage, tail surfaces and landing gear are constructed of welded steel tubing. The ailerons and wings are of wood. The two models are fabric covered. The KR-34C is equipped with a Hamilton-Standard propeller; the KR-34D with a Curtiss Reid metal propeller. Both have oleo-spring shock absorbers, Bendix brakes, dual controls. Instruments and accessories are: tachometer, oil temperature and pressure gauges, altimeter, air speed indicator, compass and booster magneto. Both models accommodate three persons, including the pilot. The pilot's cockpit is aft of the passenger's cockpit. Dual controls are provided.

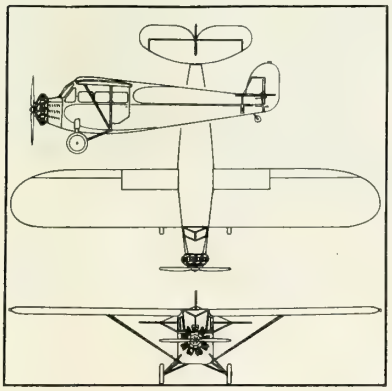
The Fairchild KR-34C and KR-34D are especially designed for the private flier or for business flying to meet the demands of the sportsman pilot or executive.



FAIRCHILD
42

See news items on pages 202 and 204 for information regarding manufacturer

Specifications: Span, 45 feet. Length overall, 30 feet 10 inches. Height overall, 9 feet 2 inches. Wing area (including ailerons), 272.4 square feet. Power loading, 14.15 pounds per horsepower. Wing loading, 15.57 pounds per square foot. Wright J-6 of 300 horsepower. Weight empty, 2,852 pounds. Useful load, 1,448 pounds. Gross weight, 4,300 pounds.

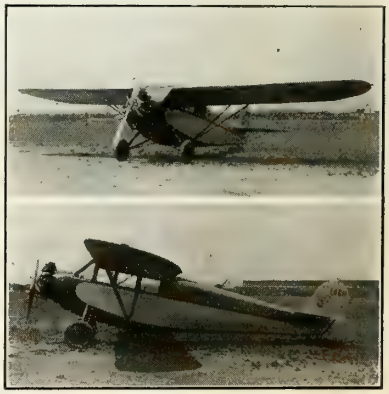


Performance: High speed, 129 miles per hour. Cruising speed, 103 miles per hour. Rate of climb, 598 feet per minute. Climb in 10 minutes, 4,990 feet. Service ceiling, 13,100 feet. Radius, 515 miles. Gasoline capacity, 100 gallons.

The fuselage is of steel tubing, fabric covered. The ailerons, tail surfaces and landing gear are of steel tubing; the wings are of wood. The plane is equipped with a Hamilton-Standard propeller, oleo-spring shock absorbers, Eclipse hand inertia starter, Bendix brakes. The instrument panel is fitted with altimeter, air speed indicator, compass, clock, tachometer, oil temperature thermometer, oil pressure gauge, turn and bank indicator. Navigation lights are installed.

The Model 42, a high-wing cabin monoplane, accommodates four persons, including the pilot, with baggage. Dual controls are provided. The wings employ the Fairchild folding device. The landing gear consists of wide spread wheels fitted with brakes and a full swiveling tail wheel.

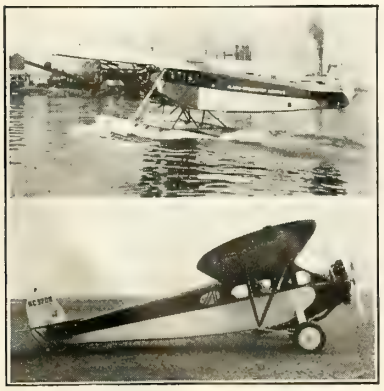
Pontoons or skis are interchangeable on all planes. The seating arrangement is in pairs in tandem. The controls are dual. The combination baggage compartment and lavatory is installed behind passengers' cabin.



FAIRCHILD
71

See news items on pages 202 and 204 for information regarding manufacturer

Specifications: Span, 50 feet. Length overall, 32 feet 11 inches. Height overall, 9 feet 4 inches. Wing area (including ailerons), 309.6 square feet. Power loading, 13.10 pounds per horsepower. Wing loading, 17.75 pounds per square foot. Pratt & Whitney Wasp 420 horsepower. Weight empty, 3,130 pounds. Useful load, 2,370 pounds. Gross weight, 5,500 pounds.

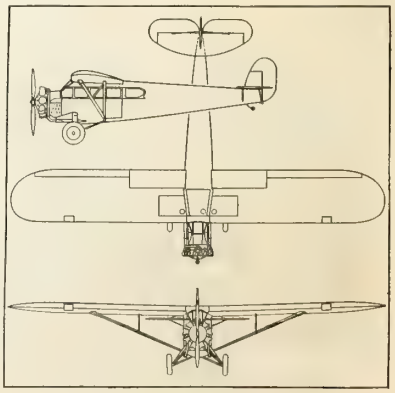


Performance: High speed, 132.5 miles per hour. Cruising speed, 110 miles per hour. Rate of climb, 790 feet per minute. Climb in 10 minutes, 6,100 feet. Service ceiling, 13,800 feet. Radius, 590 miles. Gasoline capacity, 148 gallons.

The fuselage, tail surfaces and ailerons are of welded steel tubing, fabric covered. The wings, which employ the Fairchild folding device, are of wood. The plane is equipped with Hamilton-Standard propeller, oleo-spring shock absorbers, Eclipse hand inertia starter, Bendix brakes and an instrument panel fitted with altimeter, air speed indicator, compass, clock, tachometer, oil temperature thermometer, oil pressure gauge, and turn and bank indicator. Navigation lights are provided. Tires are optional.

The cabin accommodates seven persons, including pilot, and allows 35 cubic feet for baggage. Skis or pontoons may be readily attached. An engine silencer and heater for the cabin contribute to the comfort of passengers.

The Fairchild 71 is designed for a diversity of services, especially for aerial photographic purposes. The wings employ the Fairchild folding wing device. The landing gear consists of wide spread wheels fitted with brakes.



































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Airline operators respect the Parks diploma because they know that no second-rater can get it. Men come to Parks as to Harvard, Yale, or Columbia—because Parks training is the last word.

Are you going into aviation determined to make good, and ready to work for your success? For men of vision and grit, there's only one school—Parks! "Skyward Ho" tells you all about it. Send the coupon for this interesting book.



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SECTION 4-AD

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I am interested in ☐ Mechanic's Course ☐ Limited Commercial Course ☐ Transport Pilot's Course.

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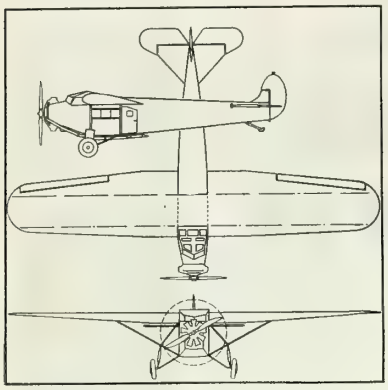
City State

Age Occupation



FOKKER
UNIVERSAL
Fokker Aircraft Company of America
New York, New York

Specifications: Span, 47 feet 9 inches. Length overall, 33 feet 6 inches. Height overall, 8 feet 6 inches (landplane). Wing area (including ailerons), 341 square feet. Wright R-975 of 300 horsepower. Power loading, 14.33 pounds per horsepower. Wing loading, 12.61 pounds per square foot. Weight empty, 2,482 pounds; Useful load, 1,818 pounds; Gross weight, 4,300 pounds.



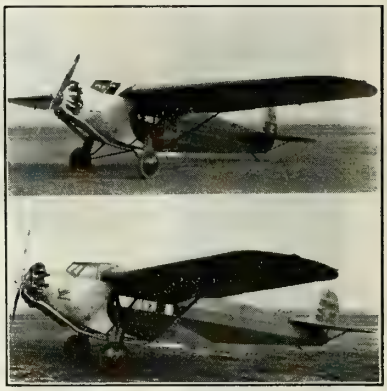
Performance: High speed, 130 miles per hour. Cruising speed, 105 miles per hour. Landing speed, 52 miles per hour. Rate of climb, 800 feet per minute. Climb in 10 minutes, 6,800 feet. Service ceiling, 14,000 feet. Radius, 535 miles. Gasoline capacity, 79 gallons.

The framework of the fuselage and tail surfaces is of welded steel tubing covered with fabric. Braced monoplane wing has a framework of wood construction, two spars, laminated spruce flanges and plywood ribs, covered with plywood.

The landplane has a landing gear of the split-axle type, equipped with Goodyear, or Goodrich or U. S. tires. Sauzedde brakes, tail skid, and rubber cord shock absorbers. The landing gear is interchangeable with Edo seaplane floats. Equipment includes Hamilton-Standard propeller, hand inertia starter, Fokker instrument panel, Pioneer instruments, Pyrene fire extinguisher, radio shielding.

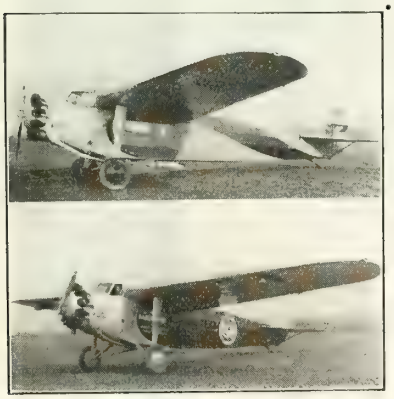
The Fokker Universal landplane accommodates seven persons and has a baggage compartment of 30 cubic feet. Four passenger seats are provided; two additional seats are optional. Rudder control is dual.

For additional information see advertisement on page 99 of this issue



FOKKER
SUPER UNIVERSAL
Fokker Aircraft Company of America
New York, New York

Specifications: Span 50 feet 8 inches. Length overall, 36 feet 11 inches. Height overall, landplane) 9 feet 1 inch; (seaplane) 11 feet 2 inches. Wing area (including ailerons), 387 square feet. Pratt & Whitney Wasp C 425 horsepower. Power loading 13.1 pounds per horsepower. Wing loading, 14.3 pounds per square foot. (Landplane and seaplane, respectively) Weights empty, 3,250; 3,550 pounds. Useful loads, 2,300; 2,000 pounds. Gross weights, 5,550; 5,550 pounds.



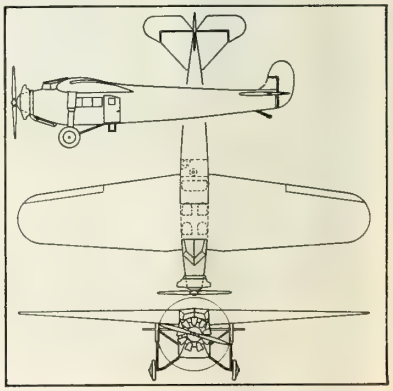
Performance: (Landplane) High speed, 138 miles per hour. Cruising speed, 118 miles per hour. Landing speed, 56 miles per hour. Rate of climb, 850 feet per minute. Climb in 10 minutes, 7,000 feet. Service ceiling, 18,000 feet. Radius, 675 miles. Gasoline capacity, 120 gallons.

The framework of the fuselage is constructed of welded steel tubing, covered with fabric.

The landplane has a landing gear of the split-axle type, equipped with rubber shock cord, Goodyear, or Goodrich or U. S. tires. Sauzedde brakes and tail skid. The landing gear is interchangeable with Edo seaplane floats. Equipment includes Hamilton-Standard propeller, hand inertia starter, Fokker instrument panel, Pioneer instruments, Pyrene fire extinguisher, navigation lights, radio shielding adjustable nose cowl.

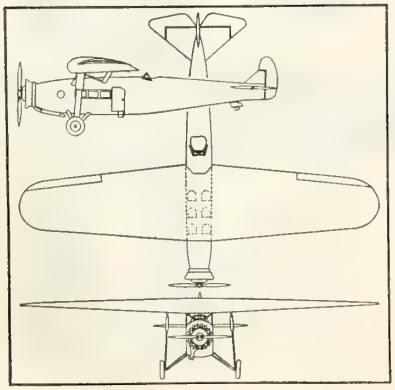
The Fokker Super Universal accommodates eight persons (landplane) seven persons (seaplane) and has baggage space of 30 cubic feet.

Six seats are provided in the cabin; one in cockpit as seaplane, two in cockpit as landplane.



FOKKER
AF-XIV, AF-XIV-A
Fokker Aircraft Company of America
New York, New York

Specifications: Span, 59 feet 5 inches. Length overall, 43 feet 4 inches. Wing area (including ailerons), 550 square feet. (Models AF-XIV, AF-XIV-A, respectively) Heights overall, 12 feet 4 inches; 11 feet. Pratt & Whitney Hornet A 525 horsepower; Pratt & Whitney Hornet B 575 horsepower. Power loadings, 13.7; 13 pounds per horsepower. Wing loadings, 13.1; 13.5 pounds per square foot. Weights empty, 4,346; 4,525 pounds. Useful loads, 2,854; 2,925 pounds. Gross weights, 7,200; 7,450 pounds.

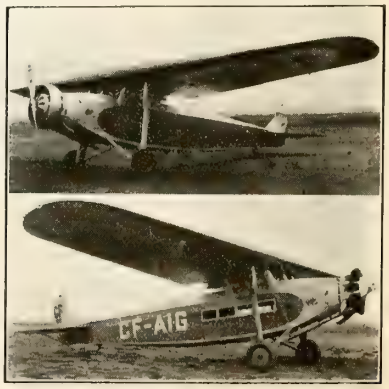


Performance: High speeds, 137; 145 miles per hour. Cruising speeds, 116; 122 miles per hour. Landing speeds, 52; 55 miles per hour. Rates of climb, 710; 850 feet per minute. Climb in 10 minutes, 6,000; 7,000 feet. Service ceilings, 14,300; 16,000 feet. Radii, 730; 600 miles. Gasoline capacities, 170; 140 gallons.

The framework of the fuselage is constructed of chrome-molybdenum steel tubing. The sides and bottom of the fuselage are covered with fabric; the top is covered with corrugated duralumin. Ailerons are of the Frise type. Tail surfaces have a framework of welded steel tubing.

The landing gear is of the split-axle tripod type, provided with tail wheel, Gruss shock absorbing struts, Bendix brakes, Goodyear or Goodrich or U. S. tires. Propeller is Standard-Steel. Electric and hand inertia starter, Fokker instrument panel, Pioneer instruments are provided.

Capacity of model AF-XIV is from seven to nine persons; of model AF-XIV-A, ten persons. Variable seating arrangement is provided in model AF-XIV.





FOKKER
SUPER-UNIVERSAL

PROFIT by the feeder line

MORE feeder lines are starting in operation this spring than ever before. For there are real possibilities in them and in charter and taxi work at your airport, provided a wise choice is made of planes.

And it has been proved in cold, black figures that the profitable ship for this kind of work is the Fokker Super-Universal. It is economical to operate, sturdy, speedy and durable.

Powered by a Pratt & Whitney 425 h.p. "Wasp" engine; six passenger seats and baggage or lavatory room.

The Super-Universal is in profitable use by many of the most successful lines, such as Western Canadian Airways, Mid-Continent Airways, Dixie Flying Service, Southern Air Transport and National Parks Airways.

A Limited Number of Real Bargains

We have on hand certain Super-Universals and other Fokker planes that have been used as *demonstrators* —at bargain prices. The list includes:

STANDARD UNIVERSAL	F-10A TRIMOTOR
SUPER-UNIVERSAL	F-11A AMPHIBIAN
F-14A MAIL PLANE	F-32

These airplanes are in splendid mechanical condition; "new" in appearance and are fully guaranteed by us. The number is limited but while they last, they represent exceptional profit opportunities.

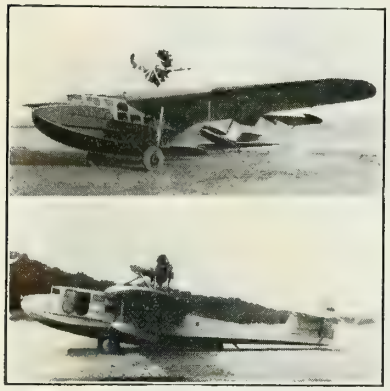
• FOKKER •

AFFILIATED WITH GENERAL MOTORS CORPORATION

FOKKER AIRCRAFT CORPORATION OF AMERICA, GENERAL MOTORS BUILDING, NEW YORK

FOKKER
AMPHIBION AF-XI-A
Fokker Aircraft Company of America
New York, New York

Specifications: Span, 59 feet. Length overall, 45 feet 10 inches. Height overall, 14 feet 5 inches. Wing area (including ailerons), 550 square feet. Wright Cyclone or Pratt & Whitney Hornet of 575 horsepower. Power loading, 12.52 pounds per horsepower. Wing loading, 13.1 pounds per square foot. Weight empty, 5,065 pounds; Useful load, 2,135 pounds; Gross weight, 7,200 pounds.



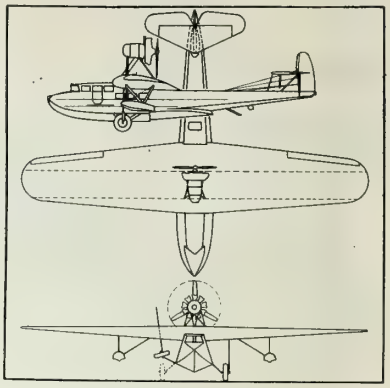
Performance: High speed, 116 miles per hour. Cruising speed, 100 miles per hour. Landing speed, 55 miles per hour. Rate of climb, 700 feet per minute. Climb in 10 minutes, 5,800 feet. Service ceiling, 11,000 feet. Radius, 430 miles. Gasoline capacity, 120 gallons.

The hull is constructed of riveted aluminum alloy. Ailerons are Frise type. The fin is built of aluminum alloy. Stabilizer, rudder and elevators are built of welded steel tubing, fabric covered. The wings are one-piece full cantilever with a framework of wood construction.

Retractable landing gear of the split-axle tripod type with tail skid is provided. Shock absorbers are rubber cord, brakes are Bendix, tires are Goodyear, or Goodrich or U. S. A three-bladed Hamilton-Standard propeller, electric and hand inertia starter, Fokker instrument panel, and Pioneer instruments are provided. Equipment includes anchor and rope, two Pryene fire extinguishers, life preservers, navigation lights, shielded wiring.

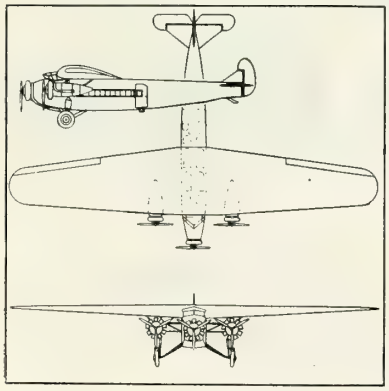
The ship accommodates seven persons; six seats in cabin and two pilots' seats.

For additional information see advertisement on page 99 of this issue



FOKKER
AF-IX, AF-X-A
Fokker Aircraft Company of America
New York, New York

Specifications: (Models AF-IX, AF-X-A, respectively) Span, 72 feet 10 inches; 79 feet 3 inches. Length overall, 48 feet 9 inches; 50 feet 7 inches. Height overall, 12 feet 6 inches; 12 feet 9 inches. Three Wright R-975's totaling 900 horsepower; three Pratt & Whitney Wasp C's totaling 1,275 horsepower. Power loadings, 12.36; 11 pounds per horsepower. Wing loadings, 14.74; 16.4 pounds per square foot. Weights empty, 7,100; 8,500 pounds. Useful loads, 3,025; 5,500 pounds; Gross weights, 11,125; 14,000 pounds.

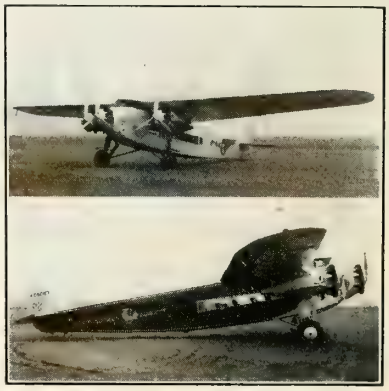


Performance: High speeds, 142; 153.75 miles per hour. Cruising speeds, 115; 126 miles per hour. Landing speeds, 60; 60 miles per hour. Rates of climb, 910; 1,000 feet first minute. Climb in 10 minutes, 7,200; 8,000 feet. Service ceilings, 18,500; 18,000 feet. Radii, 515; 755 miles. Gasoline capacities, 210; 360 gallons.

Model AF-IX accommodates 10 persons, and model AF-XA 14 persons. There are eight seats in the cabin and two in the cockpits of the former model; twelve seats in the cabin and two in the cockpit of the latter.

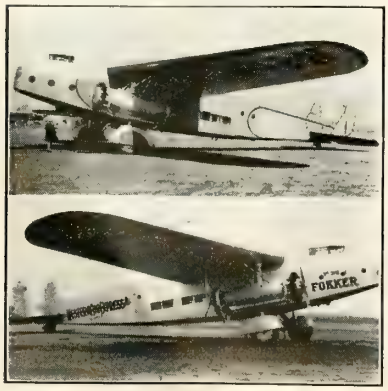
The framework of the fuselage is constructed of chrome-molybdenum steel tubing covered with fabric. Ailerons are Frise type. Tail surfaces are of tubular steel construction, fabric covered. The wings are one-piece full cantilever with a framework of wood construction, two spars, laminated spruce flanges and plywood ribs.

The landing gear is of the split-axle tripod type with rubber cord shock absorbers, tail wheel, Goodyear, or Goodrich or U. S. tires, Sauzedde brakes on AF-X-A, Bendix brakes on AF-IX.



FOKKER
AF-32
Fokker Aircraft Company of America
New York, New York

Specifications: Span, 99 feet. Length overall, 70 feet 2 inches. Height overall, 16 feet 2 inches. Wing area (including ailerons), 1,330 square feet. Four Pratt & Whitney Hornet B's totaling 2,300 horsepower. Power loading, 10.6 pounds per horsepower. Wing loading, 18.23 pounds per square foot. Weight empty, 15,080 pounds; Useful load, 9,170 pounds; Gross weight, 24,250 pounds.

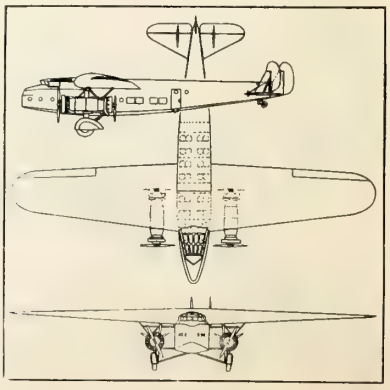


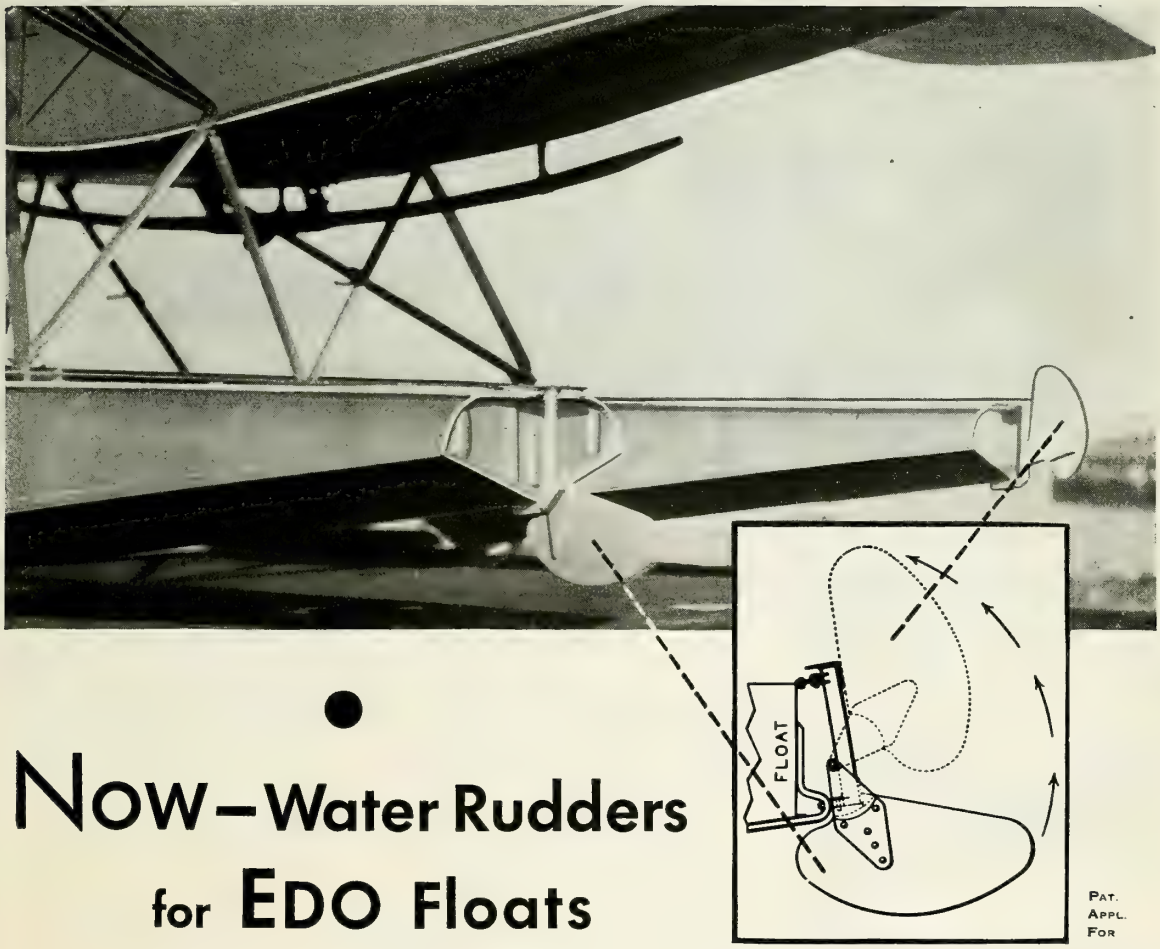
Performance: High speed, 146.61 miles per hour. Cruising speed, 123 miles per hour. Landing speed, 60 miles per hour. Rate of climb, 850 feet per minute. Climb in 10 minutes, 7,000 feet. Service ceiling, 13,000 feet. Radius, 530 or 770 miles. Gasoline capacity, 480 or 700 gallons.

The Fokker AF-32 accommodates thirty-two persons and has a baggage compartment with a volume of 120 cubic feet. The cabin is divided into four compartments with pantry in center.

The framework of the fuselage is constructed of welded chrome-molybdenum steel tubing, fabric covered. Ailerons are Frise type. Tail surfaces are of tubular steel construction, fabric covered. The wing is one-piece full cantilever, tapered in plan and form, with two wood spars, laminated spruce flanges and plywood ribs, covered with plywood.

Landing gear is of the split-axle tripod type of chrome-molybdenum steel, provided with tail wheel, Gruss shock absorber struts, Bendix brakes, Goodrich tires. Equipment includes Hamilton-Standard propellers (two two-bladed, two three-bladed), Pioneer and Western instruments, radio shielding, Balsa wood soundproofing and Eclipse starter.





NOW—Water Rudders for EDO Floats

PAT. APPL. FOR

AUTOMATIC water rudders developed by EDO bring a new efficiency to float performance. Coupled with the broad planing stern of EDO Floats, seaplanes so equipped may now be taxied on the water with the same sharp, sure response of a motor boat. By their use, the possibility of engine-overheating and spray damage to propeller in taxying is eliminated, and maneuvering in limited space is made positive and easy.

The horizontal hinge provides an automatic reefing feature assuring correct steering areas at all speeds. In combination with the rounded form, it also allows the rudder to swing up when striking objects as well as when backing into a beach. Installation is a simple operation. The water rudders connect with the regular rudder control through the use of springs and are so designed as to eliminate the possibility of jamming under any conditions. The rudders have been thoroughly tested and approved by the Department of Commerce.

EDO Automatic Water Rudders are available for all standard sizes of EDO Floats. For further information and prices, address, EDO Aircraft Corporation, 610 Second Street, College Point, Long Island, N. Y.

EDO

THE FLOAT MAKERS

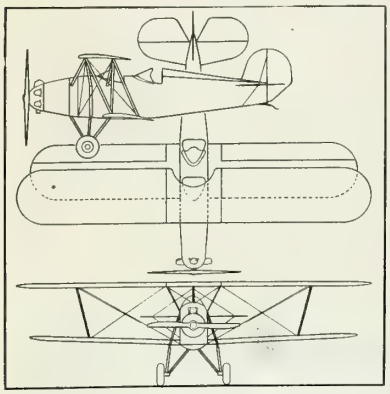
See EDO Floats and Water Rudders at the EDO Exhibit, International Aircraft Show at Detroit, April 11-19

FRANKLIN

SPORT A AND 90

Franklin Airplane Corporation
Franklin, Pennsylvania

Specifications: (Models A and 90 respectively). Span, upper wings, 26 feet; lower wings, 24 feet. Length overall, 19 feet 6 inches. Height overall, 7 feet 9 inches. Wing area (including ailerons), 185 square feet. Power loadings, 21; 15.7 pounds per horsepower. Wing loadings, 7.08; 7.64 pounds per square foot. Lambert Velie M-5 of 70 horsepower; and Lambert 90 horsepower (with exhaust ring). Weights empty, 845; 845 pounds; useful loads, 484; 570 pounds; gross weights: 1,312; 1,415 pounds.

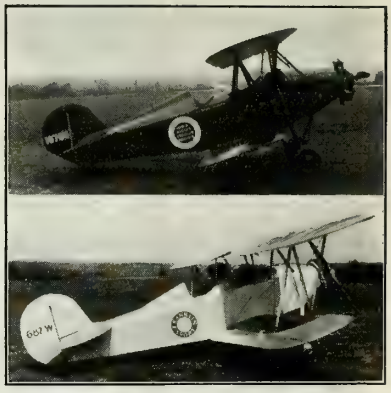


Performance: High speeds, 100; 120 miles per hour. Cruising speeds, 85; 105 miles per hour. Landing speeds, 30; 30 miles per hour. Rate of climb, 550; 900 feet per minute. Climb in 10 minutes, 5,000; 8,000 feet. Service ceilings, 10,000; 12,000 feet. Radius, 350; 430 miles. Gasoline capacities; 18; 24 gallons.

The fuselage is the tandem type of construction using welded steel tubing of chrome-molydbenum and 1,025 S. A. E. specification.

The wings have spars and ribs of solid Sitka spruce. The wings are internally braced with MacWhyte tie-rods with safe lock terminals. The landing gear is of the split-axle type with oleo shock struts and Goodyear Airwhels. The propeller is wood or Hamilton-Standard. Heywood starter and Goodyear brakes are extra. The instrument panel is Consolidated Type B. Other accessories are dual controls, Stromberg gas filter, parachute seats, fire extinguisher. The plane accommodates two persons.

For additional information see advertisement on pages 30, 31 of this issue

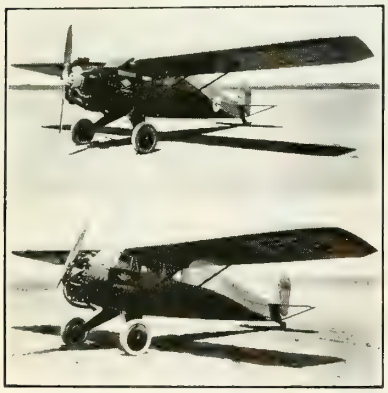


GENERAL

ARISTOCRAT 102-F, 102-E, 102-A

General Airplanes Corporation
Garden City, Long Island, N. Y.

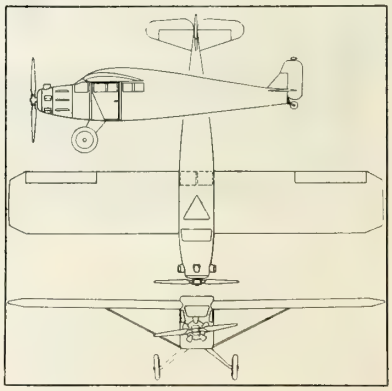
Specifications: (Models 102-F, 102-E, and 102-A respectively). Span, 36 feet 8.5 inches; 36 feet 8.5 inches; 36 feet 4 inches. Length overall, 26 feet 3.12 inches; 26 feet 6.5 inches; 25 feet 4 inches. Height overall, 8 feet .5 inch; 8 feet .5 inch; 7 feet 9 inches. Wing area (including ailerons), 198.10, 198.10 square feet; 195.4 square feet. Power loadings, 14.1 pounds per horsepower; 14.1 pounds per horsepower; 19.2 pounds per horsepower. Wing loadings, 11.7 pounds per square foot; 11.7 pounds per square foot; 10.8 pounds per square foot. Continental 170 horsepower; Wright J-6-5 of 165 horsepower; Warner, 110 horsepower.



Weights empty, 1,525; 1,523; 1,266 pounds. Useful loads, 800; 801; 844 pounds. Gross weights, 2,325; 2,324; 2,110 pounds.

Performance: High speeds, 132; 130; 110 miles per hour. Cruising speeds, 110; 110; 89 miles per hour. Landing speeds, 45; 48; 42 miles per hour. Rates of climb, 760; 750; 650 feet per minute. Climb in 10 minutes, 6,500; 6,000; 5,000 feet. Service ceiling, 17,500 feet; 16,700 feet; 12,150 feet. Gasoline capacities, 42 gallons each. Radius, 365; 365; 550 miles.

The fuselage of all models is of chrome-molybdenum steel, fabric covered. The ailerons are of steel and duralumin; tail surfaces are of steel. Construction of the wings is of wood. The landing gear is full cantilver and is constructed of heat treated duralumin. The propeller is Hamilton-Standard; shock absorbers are rubber discs. Bendix brakes and a Consolidated instrument panel are used. Special instruments are optional. Each model accommodates three persons, including the pilot.

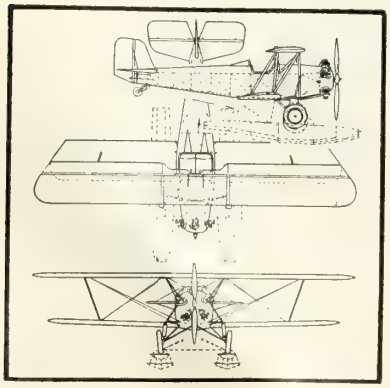


GRANVILLE

GEE BEE A

Granville Brothers Aircraft, Inc.
Springfield, Massachusetts

Specifications: Span, upper wing, 29 feet 2 inches; lower wing, 26 feet 3 inches. Length overall, 20 feet 7 inches. Height overall, 8 feet 6 inches. Wing area (including ailerons), 185 square feet. Power loading, 16.5 pounds per horsepower. Wing loading, 8.9 pounds per square foot. Kinner K5 of 100 horsepower. Weight empty, 1,060 pounds; useful load, 590 pounds; gross weight, 1,650 pounds.



Performance: High speed, 109 miles per hour. Cruising speed, 92 miles per hour. Landing speed, 39 miles per hour. Rate of climb, 800 feet per minute. Climb in 10 minutes, 5,100 feet. Service ceiling, 11,000 feet. Radius, 400 miles. Gasoline capacity, 26 gallons.

The ailerons are Frise type and are extra large in size. The full tail surfaces use an especially thick section. The wings are of spruce spars and ribs; with dural umin tube compression ribs and swaged tie rod drg bracing. The landing gear is wide tread. A pneumatic full-swivelling tail wheel is standard equipment. The propeller is Hartzell wood or Hamilton-Standard. The shock-absorbers are of Gee Bee make of oleo and compression rubber. The tires are 28 inches by 5 inches. Heywood starter is extra. Bendix or Aircraft Products brakes are standard equipment. Standard equipment includes all engine instruments, air speed meter, altimeter, inclinometer, and compass. A turn and bank indicator and rate of climb indicator are extra. The plane seats two persons side-by-side. Allowance is made for 30 pounds of baggage.

For additional information see advertisement on page 103 of this issue



JUST IMAGINE



A Two Place

Gee Bee

SENIOR SPORTSTER

This is the performance of the Warner Powered Gee Bee Sportster

H. P.	Wing Loading	Power Loading	Top Speed	Cruising Speed	Climb 1st Minute	Landing Speed
110	13	11	149	130	1600	50

...and the new GeeBee Senior Sportster powered by Wasp, Jr., Engine!

H. P.	Wing Loading	Power Loading	Top Speed	Cruising Speed	Climb 1st Minute	Landing Speed
300	13	6	*Just Imagine . . .*			

SEE IT AT THE DETROIT SHOW

GRANVILLE BROS. AIRCRAFT, INC.

SPRINGFIELD
MASSACHUSETTS

GRANVILLE

GEE BEE SPORTSTER E

Granville Brothers Aircraft, Inc.
Springfield, Massachusetts

Specifications: Span, 25 feet. Length overall, 16 feet 9 inches. Height overall, 8 feet. Wings area (including ailerons) 95 square feet. Power loading, 12.7 pounds per horsepower. Wing loading, 14.7 pounds per square foot. Warner 110 horsepower. Weight empty, 912 pounds; useful load, 488 pounds; gross weight, 1,400 pounds.

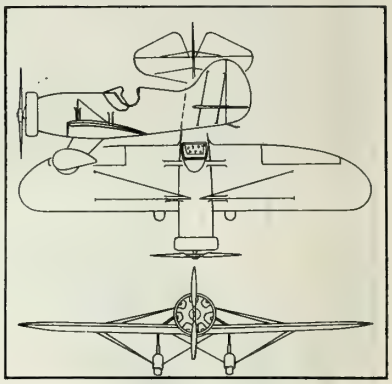


Performance: High speed, 148 miles per hour. Cruising speed, 127 miles per hour. Landing speed, 52 miles per hour. Rate of climb, 1,600 feet per minute. Climb in 10 minutes, 11,500. Service ceiling, 19,000 feet. Radius, 550 miles. Gasoline capacity, 37 gallons.

The fuselage construction is of welded chrome-molybdenum steel tubing throughout. There are no welds in tension members. A detachable engine mount allows the use of any inverted, in-line or radial engine. Ailerons are of sheet steel ribs, fabric covered, and are torque tube operated. Tail surfaces are of chrome-molybdenum tubing. Spars and ribs of the wing are made from Sitka spruce; compression tubes are of duralumin. Swaged tie rod drag bracing is used. The landing gear uses hydraulic shock struts with six-inch oleo travel, rubber shock absorbers for taxying, and 20-inch-by-9-inch wheels. The whole landing structure is enclosed in streamlined pants.

The propeller is Hamilton-Standard or Curtiss Reed. Heywood starter is optional. Instruments furnished include compass, air speed indicator, inclinometer, and all engine instruments. A Townend Ring is standard equipment.

For additional information see advertisement on page 103 of this issue

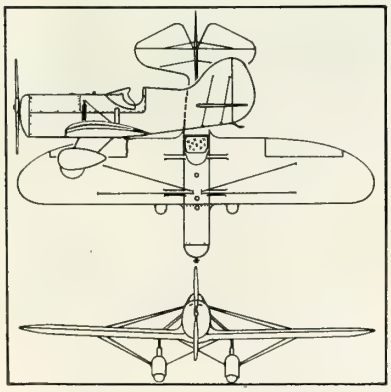


GRANVILLE

GEE BEE SPORTSTER D

Granville Brothers Aircraft, Inc.
Springfield, Massachusetts

Specifications: Span, 25 feet. Length overall, 17 feet 3 inches. Height overall, 8 feet. Wing area (including ailerons) 95 square feet. Power loading, 11.2 pounds per horsepower. Wing loading, 14.7 pounds per square foot. Menasco Pirate C-4 125 horsepower. Weight empty, 900 pounds; useful load, 500 pounds; gross weight, 1,400 pounds.



Performance: High speed, 159 miles per hour. Cruising speed, 135 miles per hour. Landing speed, 52 miles per hour. Rate of climb, 1,700 feet per minute. Climb in 10 minutes, 12,300 feet. Service ceiling, 20,000 feet. Radius, 500 miles. Gasoline capacity, 37 gallons.

The fuselage is of chrome-molybdenum welded steel tubing, fabric covered. A detachable engine mount allows the use of any inverted, in-line or radial engine. The ailerons are constructed of sheet steel ribs, fabric covered, and are torque-tube operated. The tail surfaces are chrome-molybdenum tubing, fabric covered. The wing is tapered and is constructed of spruce spars and ribs, duralumin compression tubes and swaged tie rod drag bracing. Wing is fabric covered. The landing gear uses oleo and compression rubber shock struts. Wheel pants are provided. The propeller is Hamilton-Standard or Curtiss Reed. The gas system is arranged to feed fuel when in inverted position as well as when flying in usual position. The plane accommodates one person. Fabric used on the Gee Bee Sportster is Dartmouth-tex with nine coats of Berryloid pigmented dope.

For additional information see advertisement on page 103 of this issue



GREAT LAKES

SPORT-TRAINER 2T-1A

Great Lakes Aircraft Corporation
Cleveland, Ohio

Specifications: Span, upper wing, 26 feet 8 inches; lower wing, 26 feet 8 inches. Length overall, 20 feet 4 inches. Height overall, 8 feet 5.5 inches. Wing area (including ailerons), 187.6 square feet. Power loading, 17.58 pounds per horsepower. Wing loading, 8.43 pounds per square foot. American Cirrus Mark III 90 horsepower.

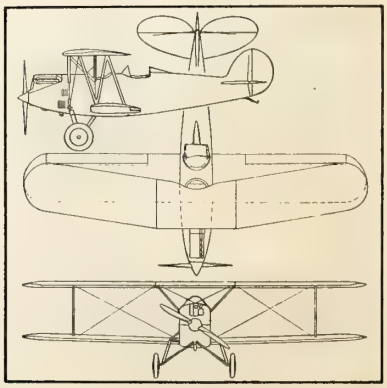


Weight empty, 1,002 pounds; useful load, 578 pounds; gross weight, 1,580 pounds.

Performance: High speed, 110 miles per hour. Cruising speed, 90 miles per hour. Landing speed, 40 miles per hour. Rate of climb, 545 feet per minute. Climb in 10 minutes, 5,000 feet. Service ceiling, 13,000 feet. Radius, 370 miles. Gasoline capacity, 26 gallons.

The fuselage is of welded chrome-molybdenum steel tubing without wire bracing, covered with Grade A fabric, Berryloid finish. Elevators and Frise-type ailerons on lower wing are operated direct by heat-treated steel tube stock. The tail surfaces are constructed of duralumin frames, riveted. Wings are of routed spruce spars and stamped duralumin ribs. Entire leading edge is covered with duralumin sheet. The N-type interplane and cabane struts are of streamlined steel tubing. The landing gear is of the split-axle type with Aerol struts. Wheels are streamlined and of wire. The propeller is Hartzell, wood; Hamilton-Standard metal optional and extra; tires are Goodyear. Eclipse starter and Goodyear, Goodrich or Bendix brakes are extra. The plane accommodates three persons. Dual controls are provided.

For additional information see advertisement on page 105 of this issue



Advancing RAPIDLY

by Right Fundamentals

Aviation, as an industry, gives renewed evidence of its great present and greater future in the National Aircraft Show at Detroit, April 11th to 19th.

Conspicuous among the notable exhibits at this impressive aircraft exposition is the masterful group of Great Lakes airplanes.

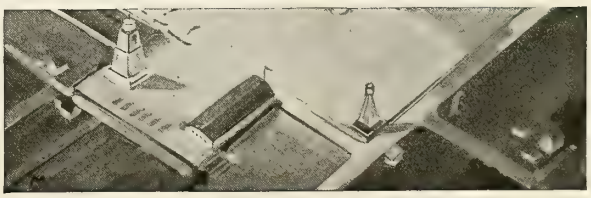
The Great Lakes Sport Trainer is an outstanding example of the country wide popular following that an airplane can create for itself, when it embodies a truly advanced conception of airplane production.

The Great Lakes Sport Trainer is the product of a thoroughly organized and modernly equipped plant. It is designed and engineered according to the latest principles of aerodynamics. And it is built with consummate craftsmanship, under the most rigid of supervisory and inspection systems.



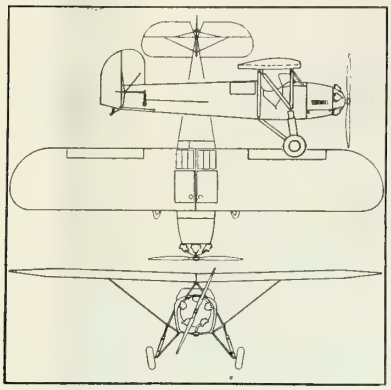
GREAT LAKES AIRCRAFT
CORPORATION **CLEVELAND**
Contractors to the United States Army and Navy

If you attend the show be sure to see this ace of Great Lakes craft. If you do not reach the show, write today for the complete data on the Great Lakes Sport Trainer for 1931 and you will have some of the best news the show affords.



INLAND
SPORT
Inland Aviation Company, Kansas City, Kansas

Specifications: Span 30 feet. Length overall, 19 feet. Height overall, 7 feet 7 inches. Wing area (including ailerons), 144 square feet. Models S-500 Super Sport, R-400 "Sportster," respectively, powered with Warner Scarab 110 horsepower, Warner Scarab, Junior, 90 horsepower. Power loadings, 13.5; 16 pounds per horsepower.



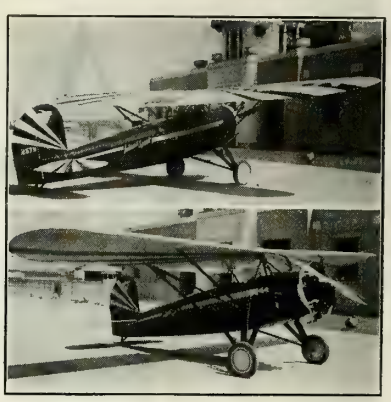
Wing loadings, 10.1; 10 pounds per square foot. Weights empty, 916; 858 pounds. Useful loads, 574; 609 pounds. Gross weights, 1,490; 1,438 pounds.

Performance: High speeds, 132; 120 miles per hour. Cruising speeds, 100; 90 miles per hour. Landing speeds, 45; 39 miles per hour. Rates of climb, 1,650; 1,156 feet per minute. Climb in 10 minutes, 10,000; 8,500 feet. Service ceilings, 19,659; 16,500 feet. Radii, 500; 450 miles. Gasoline capacities, 31; 24 gallons.

The framework of the wings is built of wood ribs and spars, fabric covered. Fuselage framework is of welded steel tubing covered with fabric. Framework of the ailerons and tail surfaces is of metal, fabric covered.

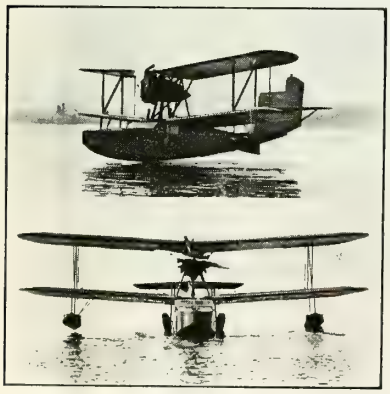
The landing gear is the split-axle type equipped with oil-draulic shock struts, Goodrich semi-Airwheels and Aircraft Products brakes. Propeller is Hamilton-Standard. Equipment includes Pioneer instruments. The Sportster has Eclipse electric starter.

The ship accommodates two persons. Seating arrangement is side by side. Bucket-type parachute seat is standard equipment. Dual controls are provided. The baggage compartment has a capacity of five cubic feet.



KEYSTONE
COMMUTER K-84
Curtiss-Wright Airplane Company New York, New York

Specifications: Span, upper wing 40 feet; span, lower wing, 40 feet. Length overall, 32 feet. Height overall, 13 feet 6 inches. Wing area, (including ailerons), 437 square feet. Power loading, 13.7 pounds per horsepower. Wing loading, 9.45 pounds per square foot. Wright Whirlwind 300 horsepower. Weight empty, 2,850 pounds; Useful load, 1,300 pounds; Gross weight, 4,150 pounds.



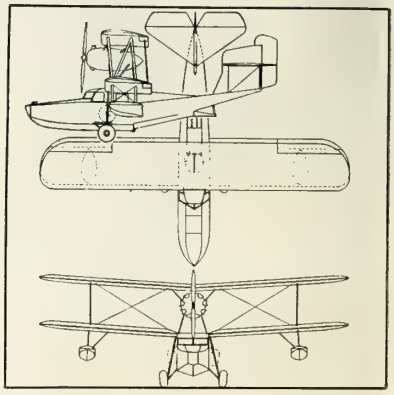
Performance: High speed, 112 miles per hour. Cruising speed, 87 miles per hour. Landing speed, 47 miles per hour. Rate of climb, 850 feet per minute. Climb in 10 minutes, 5,000 feet. Service ceiling 12,000 feet. Radius, 400 miles. Gasoline capacity, 70 gallons.

The fuselage is all duralumin boat hull with 1/16-inch plates used on the bottom forward of the step. The ailerons and tail surfaces are of wood, fabric covered. The wings have wood spars and ribs and are fabric covered. The Commuter is equipped with special Keystone retractable landing gear which is manually operated by a crank alongside the pilot's seat.

The propeller is Hamilton-Standard. The tires are Goodyear. Standard equipment includes an Eclipse electric inertia starter and Pioneer instrument panel. Other accessories are fire extinguishers, life preservers and bilge pump.

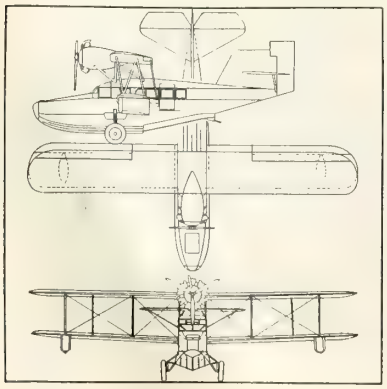
The Commuter accommodates four persons and has generous baggage accommodations. The seats are arranged in two rows. Dual controls are provided.

A forward hatch is built into the hull. Anchor and rope and Keystone special shock absorbers are standard.



KEYSTONE
AIR YACHT K-85
Curtiss-Wright Airplane Company New York, New York

Specifications: Span, upper wing, 47 feet 6 inches; span, lower wing, 47 feet 6 inches. Length overall, 35 feet 8 inches. Height overall, 13 feet 2 inches. Wing area (including ailerons), 517 square feet. Power loading, 12 pounds per horsepower. Wing loading, 12.18 pounds per square foot. Wright Cyclone 525 horsepower. Weight empty, 4,209 pounds; Useful load, 2,091 pounds; Gross weight, 6,300 pounds.



Performance, High speed, 135 miles per hour. Cruising speed, 107 miles per hour. Landing speed, 55 miles per hour. Rate of climb, 650 feet per minute. Climb in 10 minutes, 5,200 feet. Service ceiling, 12,100 feet. Radius, 500 miles. Gasoline capacity, 140 gallons.

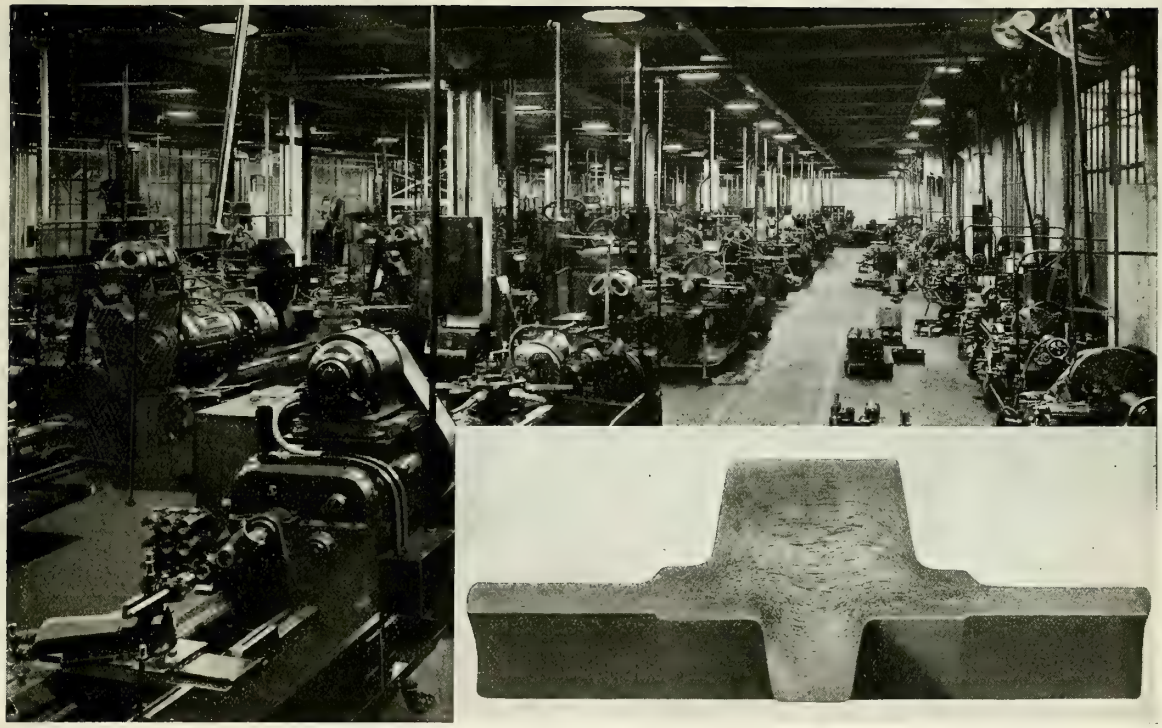
The fuselage is of composite construction with spruce members joined by duralumin gussets. The coverings is of duralumin sheeting. The ailerons are of wood covered with fabric. The tail surfaces are metal, fabric covered. The wings have wood spars and dural ribs; they are fabric covered.

The landing gear is a special Keystone retractable gear, mechanically operated. The propeller is a three-bladed Hamilton Standard. Shock absorbers are Aerol. The Air Yacht is equipped with Goodyear tires, Eclipse electric starter and Pioneer instrument panel. All instruments necessary for blind flying are provided.

The Air Yacht accommodates eight persons, including the crew. Six chairs are placed in the cabin with two places in the cockpit. A large compartment is provided for baggage. The controls are dual.

The engine is mounted at the leading edge of the upper wing center section.





Some idea of the completeness of Hamilton Standard machine tool equipment can be gained from the main illustration. Insert shows a hub section, indicating grain flow which gives these forgings maximum strength.

PROPELLER HUBS OF . . .

PROVEN DEPENDABILITY

The propeller hub is one of the most highly stressed parts in the entire airplane. In the interest of *dependability*, its design must represent the most intelligent compromise between the opposing requirements of lightness and strength.

Electric furnace steel from Timken and Central Alloy, produced in closely-controlled small heats, tells the story of steel quality. Forging, and subsequent heat-treatment by Canton Drop Forging & Manufacturing Company, pioneers in grain flow for exacting requirements, insures the development of the full strength of the forging —especially against fatigue stresses.

Precision machining and rigid final inspection in our own specially equipped shops complete the story of how Hamilton Standard propeller hubs are constructed to meet all of the exacting demands of flight—with a large factor of safety.

HAMILTON STANDARD PROPELLER CORPORATION

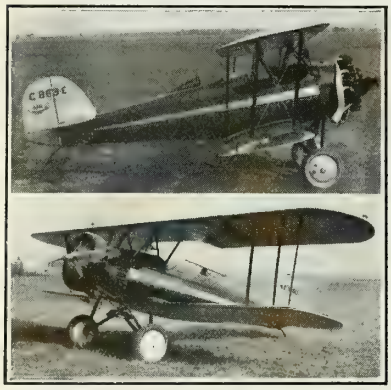
PITTSBURGH, PENNSYLVANIA

HAMILTON STANDARD PITTSBURGH PENNSYLVANIA DIVISION OF UNITED AIRCRAFT & TRANSPORT CORPORATION PROPELLER CORPORATION

DIVISION OF UNITED AIRCRAFT AND TRANSPORT CORPORATION

LAIRD
WHIRLWIND
E. M. Laird Airplane Company, Chicago, Illinois

Specifications: Span, 34 feet. Length overall, 23 feet 9 inches. Height overall, 9 feet 3 inches. Wing area (including ailerons), 295 square feet. Models LC-B200 and LC-B300, respectively, are powered with Wright J-5 Whirlwind 220 horsepower, and Wright Whirlwind J-6 300 horsepower. Power loadings, 13; 10.1 pounds per horsepower. Wing loadings, 9.6; 10.3 pounds per square foot. Weights empty, 1,800; 1,930 pounds. Useful loads, 1,050; 1,090 pounds. Gross weights, 2,850; 3,020 pounds.



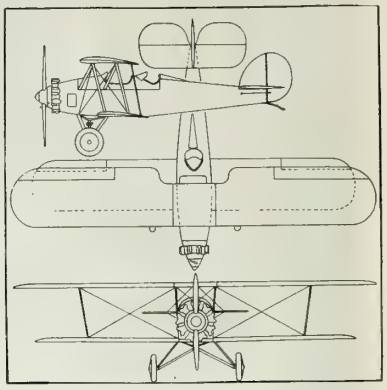
Performance: (Model LC-B200) High speed, 135 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 45 miles per hour. Rate of climb, 1,200 feet per minute. Service ceiling, 19,000 feet. Radius, 600 miles. Gasoline capacity, 78 gallons. (Model LC-B300) High speed, 150 miles per hour. Cruising speed, 120 miles per hour. Landing speed, 45 miles per hour. Rate of climb, 1,600 feet per minute. Radius, 550 miles. Gasoline capacity, 76 gallons.

The framework of the fuselage is of duralumin tubing and tie rods, covered with fabric. The framework of the fin, rudder and elevator is of steel covered with fabric. The stabilizer and ailerons have a wood framework, fabric covered. The framework of the wing is of wood covered with fabric.

The ship accommodates three persons and 50 pounds of baggage.

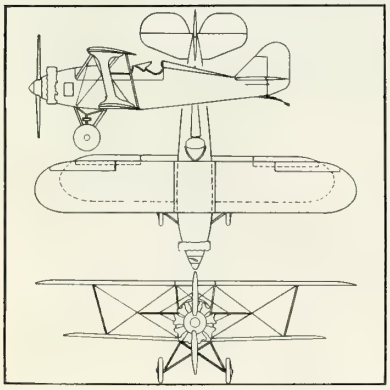
The landing gear is the split-axle type equipped with rubber shock cord, Goodrich tires and Bendix brakes. Starter is Eclipse hand inertia. Propeller is Hamilton-Standard. Pioneer instrument panel is provided.

For additional information see advertisement on page 109 of this issue



LAIRD
SPEEDWING
E. M. Laird Airplane Company, Chicago, Illinois

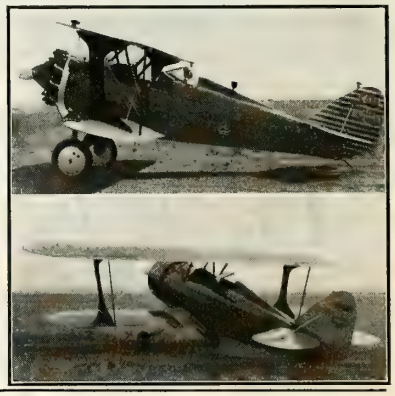
Specifications: Span, 28 feet. Length overall, 22 feet 9 inches (22 feet 7 inches on Model LC-RW300). Height overall, 9 feet. Wing area (including ailerons), 202 square feet. Models LC-R200, LC-RW300, LC-R300, respectively, are powered with Wright J-5 Whirlwind 220 horsepower, Pratt & Whitney Wasp, Junior, 300 horsepower, Wright J-6 Whirlwind 300 horsepower. Power loadings, 13.2; 10.3; 10.3 pounds per horsepower. Wing loadings, 10.3; 15.3; 15.3 pounds per square foot. Weights empty, 1,848; 1,922; 1,922 pounds. Useful loads, 1,066; 1,088; 1,088 pounds. Gross weights, 2,914; 3,010; 3,010 pounds.



Performance: High speeds, 150; 190; 175 miles per hour. Cruising speeds, 120; 150; 135 miles per hour. Landing speeds, 55; 58; 55 miles per hour. Service ceilings, 18,000; 22,000; 19,000 feet. Radii, 600; 600; 550 miles. Gasoline capacities, 76; 78; 76 gallons, respectively.

The framework of the fuselage is built of duralumin tubing and tie rods covered with fabric. Ailerons, wings and stabilizer have a wood framework, fabric covered. Fin, rudder and elevator have a steel framework. The rudder is of the balanced type. Ailerons on the upper and lower wing panels.

Split-axle type landing gear with rubber shock cord (Gruss oleo struts and Aircraft Products brakes on Model LC-RW300), Goodrich tires and Bendix brakes are provided. Equipment includes Hamilton-Standard propeller, Eclipse starter and Pioneer instrument panel. All models are three-place ships accommodating 50 pounds of baggage. Two passengers are carried in front cockpit. Controls are dual.



LINCOLN
PT-T AND PT-X
Lincoln Aircraft Co., Inc., Lincoln, Nebraska

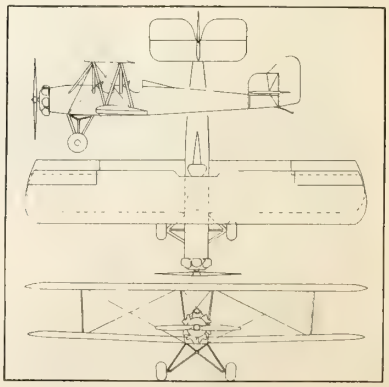
Specifications: (Models PT-T and PT-X respectively) Span, upper wings, 32 feet 2 inches; 32 feet 3 inches; span, lower wings, 27 feet 8 inches; 31 feet 9 inches. Height overall, 9 feet 4 inches; 8 feet 10 inches. Wing area (including ailerons), 277 square feet; 297 square feet. Power loadings, 18.5; 21.9 pounds per horsepower. Wing loadings, 6.64 pounds per square foot. Brownback Tiger 90 horsepower; and Curtiss OX-5 of 90 horsepower. Weights empty, 1,164; 1,428 pounds. Useful loads, 598; 540 pounds. Gross weights, 1,762; 1,968 pounds.



Performance: High speeds, 102; 101 miles per hour. Cruising speeds, 85; 82 miles per hour. Landing speeds, 38; 35 miles per hour. Rates of climb, 650; 480 feet per minute. Climb in 10 minutes 5,800; 4,200 feet. Service ceilings, 13,750; 11,400 feet. Gasoline capacities, 28.5; 29 gallons. Radii, 500; 300 miles.

The construction of the two models is identical. The fuselage is of chrome-molybdenum welded tubing, fabric covered. Ailerons are of wood construction and the tail surfaces of chrome-molybdenum welded tubing, both fabric covered. The wings employ the Göttingen 436 airfoil section and are constructed of spruce spars and bass wood ribs, fabric covered. The landing gear is Vee type of chrome-molybdenum streamlined tubing.

Both models are equipped with a Fahlin wood or steel propeller, rubber cord shock absorbers, Bloxham safety stick, bucket parachute seats, tool box, and all standard instruments. The plane accommodates two persons in a tandem seating arrangement. Dual controls are standard equipment.



Western Canada Airways Now Flies LAIRDS





WESTERN CANADA AIRWAYS operations connect the widely-separated settlements of half a continent. Their mail and passenger service cuts weeks into days, and days into hours.

Quite naturally, flight over long distances —often over difficult terrain—leads them to seek the utmost in dependability. Hence, their contract for a fleet of Laird Standard Wings pays tribute to Laird's reputation for unfailing dependability and high efficiency.

Above is pictured the first of the Western Canada Airways fleet. It is powered with the Wright J-5 200 H. P. engine, and is equipped with retractable landing lights and complete night flying equipment. A spacious mail compartment and commodious 2-passenger cockpit forward of the pilot's seat adapt these ships to every type of transport service. Three of these ships are now in their service.

Laird airplanes are built for the sportsman-pilot and the commercial buyer whose chief interest is high efficiency and dependability rather than price. We invite such buyers to write for our free booklet and the name of the nearest distributor who will arrange a demonstration.

DISTRIBUTORS

Exclusive territories available for established firms with funds and suitable demonstration facilities to handle LAIRD sales. Enlarged factory space and increased production facilities insure prompt delivery.

E. M. LAIRD AIRPLANE COMPANY

Ashburn Field -- 4500 W. 83rd St., Chicago

Laird Airplanes are manufactured only by the E. M. LAIRD AIRPLANE COMPANY, Chicago, Illinois

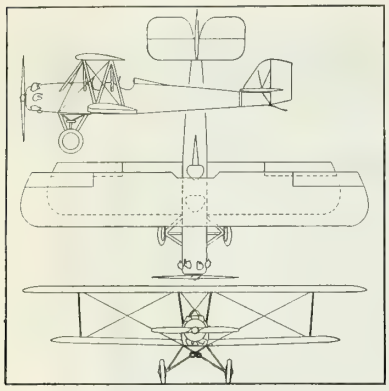
"THE THOROUGHBRED OF THE AIRWAYS"

LINCOLN

PT-K AND PT-W

Lincoln Aircraft Co., Inc., Lincoln, Nebraska

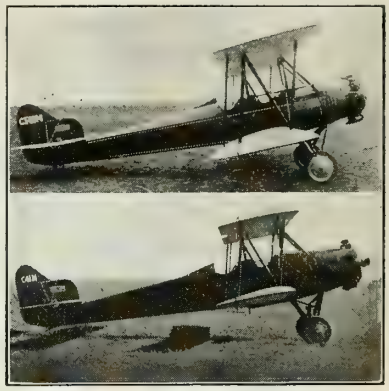
Specifications: Span, upper wings, 32 feet 3 inches; lower wings, 31 feet 9 inches. Heights overall, 9 feet 3 inches. Wing area, 297 square feet. (Models PT-K, PT-W respectively) Lengths overall, 25 feet 7 inches; 25 feet 1 inch. Power loadings, 19.-65; 16.3 pounds per horsepower. Wing loadings, 5.95; 6.04 pounds per square foot.



Kinner K-5 of 100 horsepower; Warner of 110 horsepower. Weights empty, 1,176; 1,-203 pounds. Useful loads, 591; 591 pounds. Gross weights, 1,767; 1,794 pounds.

Performance: High speeds, 104; 108 miles per hour. Cruising speeds, 85; 87 miles per hour. Landing speeds, 32; 32 miles per hour. Rates of climb 820; 870 feet per minute. Climb in 10 minutes, 7,200; 7,600 feet. Service ceilings, 13,500; 14,300 feet. Radii, 400; 400 miles. Gasoline capacities, 28.5; 28.5 gallons.

Construction of the two models is identical. The fuselage is constructed of chrome-molybdenum welded tubing, fabric covered. The ailerons are of wood construction, the tail surfaces, chrome-molybdenum welded tubing; both are fabric covered. The wings employ the Göttingen 436 airfoil section and are constructed of spruce spars and bass wood ribs. The landing gear is of the Vee type. Both models are equipped with Fahlin wood or steel propeller, rubber cord shock absorbers, and Blolxham safety stick. Each accommodates two persons| Seating arrangement is tandem. Bucket type parachute seats and tool box are standard equipment. An all-weather cowling, adjustable from the pilot's seat is provided. Controls are dual. Altimeter and tachometer are visible from either cockpit.

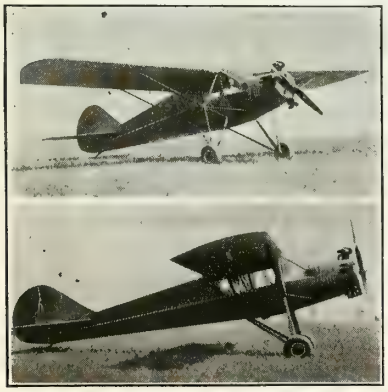


LINCOLN

AP-B5 AND AP-K5

Lincoln Aircraft Co., Inc., Lincoln, Nebraska

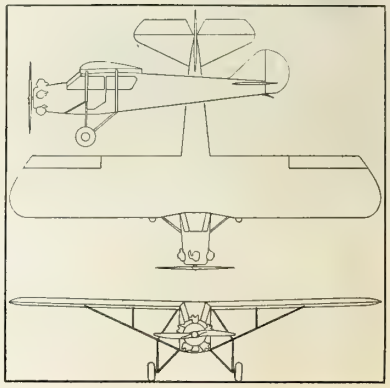
Specifications: Span, 37 feet. Length overall, 26 feet. Height overall, 8 feet 3 inches. Wing areas (including ailerons), 206.4 square feet. (Models AP-B5, AP-K5 respectively) Power loadings, 17.2; 21.5 pounds per horsepower. Wing loadings, 10.4; 10.2 pounds per square foot. Kinner B-5 of 125 horsepower; Kinner K-5 of 100 horsepower. Weights empty, 1,352; 1,320 pounds. Useful loads, 828; 828 pounds. Gross weights, 2,180; 2,148 pounds.



Performance: High speeds, 128; 112 miles per hour. Cruising speeds, 103; 97 miles per hour. Landing speeds, 48; 48 miles per hour. Rate of climb, 830; 500 feet per minute. Climb in 10 minutes, 7,400; 4,300 feet. Service ceilings, 16,150; 11,200 feet. Radii, 450; 450 miles. Gasoline capacities, 38; 36 gallons.

The construction of the two models is identical. The fuselage, ailerons and tail surfaces are constructed of chrome-molybdenum welded tubing, fabric covered. The wings have the U. S. 35 B airfoil section, spruce I section spars and bass wood ribs, fabric covered.

Both models are equipped with Fahlin wood or metal propellers, oleo spring shock struts, Aircraft Products brakes, all standard instruments, and bucket parachute seats. Each ship seats three persons, including pilot. Special features are Duolite shatterproof glass, ventilator system, and inspection doors. An all weather cowling, adjustable from the pilot's seat, is provided. The stabilizer adjustment is lever and screw. The ship is wired for navigation lights. Seating arrangement provides for the pilot forward and two passengers at the rear.

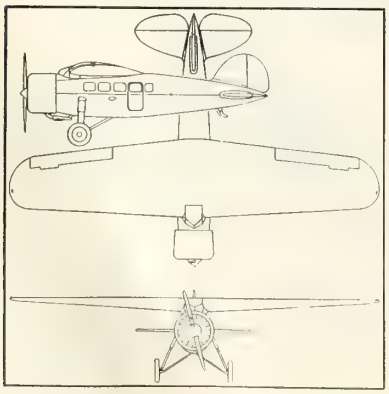


LOCKHEED

VEGA DL-1 and 5-B

Detroit Aircraft Corporation Detroit, Michigan

Specifications: Span, 41 feet. Length overall, 27 feet 6 inches. Height overall, 8 feet 2 inches. Wing area (including ailerons), 275 square feet. Pratt & Whitney Wasp 420 horsepower. Power loading, 10.70 pounds per horsepower. Wing loading, 16.35 pounds per square foot. Weight empty, 2,595 pounds. Gross weight, 4,500 pounds.



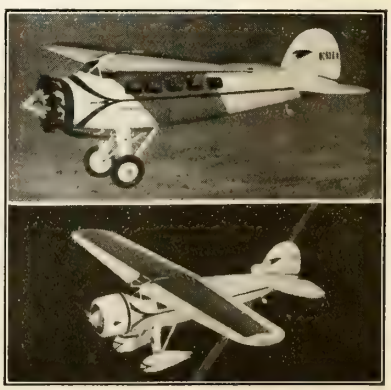
Performance: (Models DL-1 metal, 5B standard, respectively), high speeds, 180; 180 miles per hour (N. A. C. A. cowling). Cruising speeds, 155; 150 miles per hour. Rates of climb, 1,350; 1,275 feet per hour. Service ceilings, 20,000; 19,000 feet. Radii, 750; 700 miles per hour. Gasoline capacities, 100; 100 gallons.

The fuselage is monocoque. The fuselage framework of Model DL-1 is of Alclad metal covered with riveted Alclad; Model 5B, wood laminated and glued, covered with glued plywood. Ailerons and tail surfaces are conventional, plywood covered. The wings are cantilever conventional high wing. Airfoil section is Clark Y. Covering is of plywood.

The landing gear is of the split-axle type, equipped with Bendix wheels and brakes and oleo struts. Pneumatic tail wheel or skid is optional. Equipment includes Hamilton-Standard propeller, Eclipse electric starter, N. A. C. A. cowling, navigation and cabin lights.

Seven persons are accommodated. Four single adjustable seats and one rear double seat are provided. The baggage compartment is twelve cubic feet.

The Vega is approved by the Dept. of Commerce with Edo float installation.





With the experience of 38 years in rubber, and nearly a quarter century in aviation, the World's Largest Producer of Rubber is hand in hand with progress—on the earth and over it!

Planes equipped with U. S. Royal low-pressure airplane tires can be taken off and set down with greater ease and safety. They are particularly advantageous on rough or soft ground—frequently a vital necessity in forced landings!

Protect your plane, your passengers and yourself. You can change over from high-pressure tires at nominal cost. There is no compromise with safety. For complete data, consult the U. S. Rubber branch or dealer nearest you.

U.S.ROYAL AIRPLANE TIRES

LOCKHEED

SIRIUS DL-2 and 8

Detroit Aircraft Corporation
Detroit, Michigan

Specifications: Span, 42 feet 10 inches. Length overall, 27 feet 6 inches. Height overall, 9 feet 2 inches (9 feet on Model 8). Wing area (including ailerons), 275 square feet. Pratt & Whitney Wasp 420 horsepower. Models DL-2 metal, and 8, standard, respectively). Power loadings, 12.3; 10.95 pounds per horsepower. Wing loadings, 18.8; 16.7 pounds per horsepower. Weights empty, 2,958; 2,978 pounds. Gross weights, 5,170; 4,600 pounds.



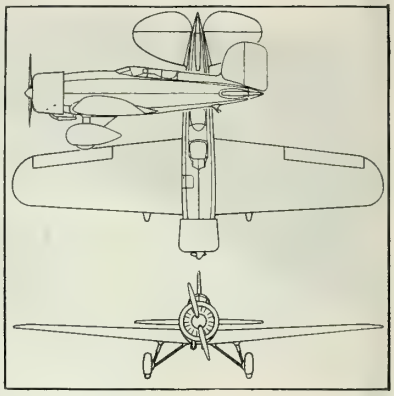
Performance: High speeds, 175; 175 miles per hour. Cruising speeds, 145; 145 miles per hour. Rates of climb, 1,100; 1,200 feet per minute. Service ceilings, 18,000; 20,000 feet. Radii, 940; 1,000 miles. Gasoline capacities, 140; 150 gallons.

The fuselage is monocoque. The fuselage of Model DL-2 is of Alclad metal covered with riveted Alclad; of Model 8, wood laminated and glued, covered with glued plywood. Ailerons and tail surfaces are conventional, plywood covered. The wings are conventional low wing. Airfoil section is Clark Y . Covering is of plywood.

The landing gear is of the split-axle type, equipped with Bendix wheels and brakes, and oleo struts. Pneumatic tail wheel or skid is optional. Equipment includes Hamilton-Standard propeller, Eclipse electric starter. N. A. C. A. cowling is standard on model 8. Standard instruments are provided. The metal job has rate-of-climb and ice-warning indicators.

Both models are two-place ships with a baggage compartment of 50 cubic feet. Cockpits are tandem. Controls are dual.

For additional information see advertisement on page 225 of this issue

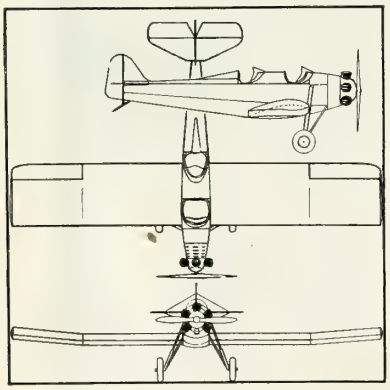


NICHOLAS-BEAZLEY

NB-4-W AND NB-4-L

Nicholas-Beazley Airplane Co., Inc.
Marshall, Missouri

Specifications: Span, 32 feet 8 inches. Length overall, 23 feet 8 inches. Height overall, 6 feet 5 inches. Wing area (including ailerons), 159 square feet. Power loading (NB-4-W), 17.5 pounds per horsepower (NB-4-L), 17.4 pounds per horsepower. Wing loading (NB-4-W), 9.91 pounds per square foot (NB-4-L), 9.81 pounds per square foot.



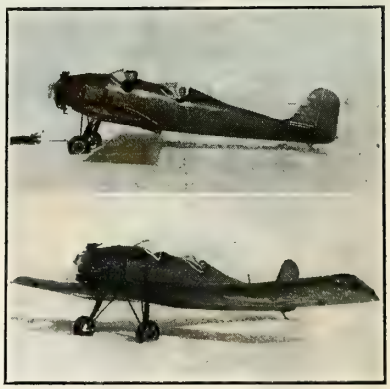
Weight empty of Model W is 892 pounds, and of Model L, 880 pounds. Useful load, both models, 683 pounds. Gross weight, Model W, 1,575 pounds, and gross weight, Model L, 1,563 pounds.

Powerplant of Model W, 90-horsepower Warner Junior. Powerplant of Model L, 90-horsepower Lambert R-266.

Performance (both models): High speed, 109 miles per hour. Cruising speed, 91 miles per hour. Landing speed, 40 miles per hour. Rate of climb, 850 feet per minute. Climb in ten minutes, 6,300 feet. Service ceiling, 16,000 feet. Endurance, 4.25 hours. Gasoline capacity, 24 gallons.

Both models are three-place ships with baggage space of 2.5 cubic feet. All-metal, full-cantilever wings without external struts or brace wires and with sectional replaceable parts provided. Fuselage of welded steel covered with doped and finished fabric. Dynamic balanced ailerons of welded tubing and cadmium-plated, bronze-bushed controls are provided. Hydraulic landing gear is of the high arch Vee type and equipped with Airwheels, Aircraft Products brakes. Eclipse inertia starter is optional. Standard flight instruments are included.

For additional information see advertisement on pages 6, 7 of this issue

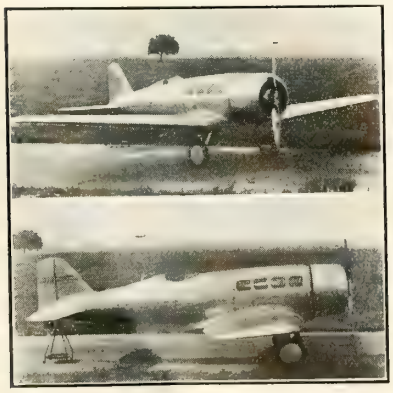


NORTHROP

ALPHA

Northrop Aircraft Corporation
Burbank, California

Specifications: Span, 41 feet 10 inches. Length overall, 28 feet 4.5 inches. Height overall, 9 feet. Wing area (including ailerons), 295 square feet. Power loading, 10.7 pounds per horsepower. Wing loading, 15.25 pounds per square foot. Pratt & Whitney Wasp C 420 horsepower. Weight empty, 2,678 pounds; Useful load, 1,822 pounds; Gross weight, 4,500 pounds.



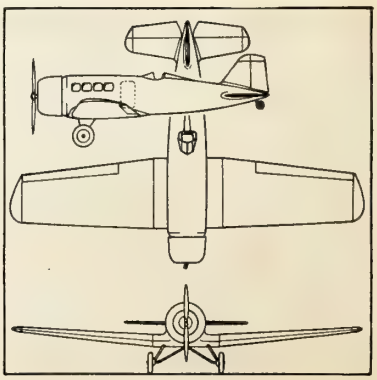
Performance: High speed, 170 miles per hour. Cruising speed, 140 miles per hour. Landing speed, 60 miles per hour. Rate of climb, 1,400 feet per minute. Climb in 10 minutes, 10,000 feet. Service ceiling, 19,300 feet. Radius, 700 miles. Gasoline capacity, 116 gallons.

The fuselage of the Alpha is monocoque and constructed entirely of metal. The covering is Alclad sheet with integrally formed longitudinal stiffeners. The ailerons have an all-metal stressed skin of Alclad. Wing and tail surfaces are multicellular in construction with all-metal stressed skin. The landing gear is conventional, of the split-axle type. Oleo shock absorbers are equipped with Edgewater rings.

The propeller is Hamilton-Standard. Goodrich low pressure tires are used. The Alpha is equipped with an Eclipse hand inertia starter and Bendix brakes.

The plane accommodates seven persons. Baggage accommodations allow 25 pounds of baggage per passenger. The seating arrangement provides for two seats, accommodating three persons each, facing each other.

The Alpha equipped with twin Edo floats has been granted an Approved Type Certificate as a seaplane.



Ruth Nichols *using* Amoco Products *sets new altitude record for women!*



TAKING off from Jersey City Airport on March 6, Miss Ruth Nichols soared to a higher altitude than any woman flier ever reached before.

Miss Nichols' four altimeters recorded a height of 30,054 feet, 2,636 feet above the present woman's record. The instruments are now at the Bureau of Standards in Washington for checking and official confirmation of this record is expected in a few days.

Miss Nichols used Amoco Products exclusively—Amoco-Gas (Aviation Grade) and Amoco Motor Oils and Greases—just as she did in her record-breaking transcontinental flights.

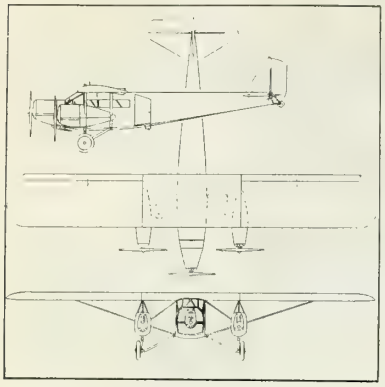
In the air or on the road—for superior performance and economical operation—make it AMOCO all the way!

The AMERICAN OIL COMPANY
General Offices: American Bldg., Baltimore, Md.



OGDEN
OSPREY
Ogden Aeronautical Corporation
Inglewood, California

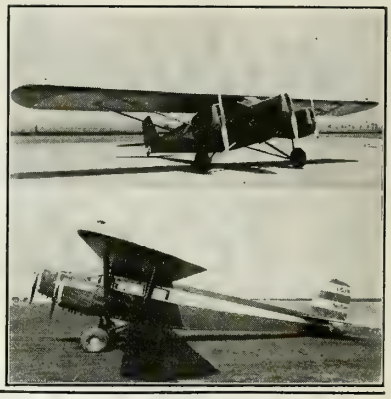
Specifications: Span, 50 feet. Length overall, 34 feet 6 inches. Height overall, 9 feet 3 inches. Wing area (including ailerons), 312 square feet. Models C and PB, respectively, powered with three American Cirrus totaling 270 horsepower, three Menasco Pirate B-4's totaling 285 horsepower. Power loading, 16.7; 15.8 pounds per horsepower. (Both models) Wing loadings, 14.4 pounds per square foot. Weights empty, 2,850 pounds; useful loads, 1,650 pounds; gross weights, 4,500 pounds.



Performance: (Both models) High speeds 130 miles per hour. Cruising speeds, 102 miles per hour. Landing speeds, 50 miles per hour. Rates of climb, 650 feet per minute. Radii, 500 miles. Gasoline capacities, 90 gallons. (Model C). Climb in 10 minutes, 5,000 feet. Service ceiling, 14,000 feet. (Model PB) Climb in 10 minutes, 5,500 feet. Service ceiling, 15,000 feet.

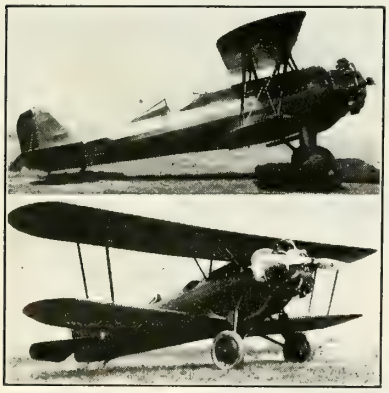
The fuselage and tail surfaces are constructed of chrome-molybdenum steel tubing covered with fabric. The framework of the ailerons is built of riveted steel ribs. The framework of the wings is built of box spars, standard ribs; leading edge is of spruce plywood.

The landing gear is built of chrome-molybdenum tubing; that of Model C is equipped with Bendix wheels and brakes, Aircraft Products oildraulic shock absorbers, and Goodyear tires; the landing gear of Model PB has Goodyear Airwheels and Goodyear brakes. Starter is Eclipse 4H4 hand turning gear. Three Hamilton-Standard metal propellers are installed. Each plane accommodates six persons.



PITCAIRN
PA-7 MAILWING AND SPORT
Pitcairn Aircraft Company, Inc.
Willow Grove, Pennsylvania

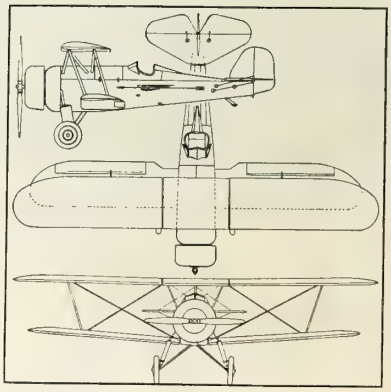
Specifications: Span, upper wing, 33 feet; lower wing, 30 feet 3.5 inches. Length overall, 23 feet 9 inches. Height overall, 9 feet 6.5 inches. Wing area (including ailerons), 243.5 square feet. Power loading, 13.55 pounds per horsepower. Wing loading, 12.50 pounds per square foot. Wright J-6-7 of 240 horsepower. Weight empty, 1,820 pounds. Payload, 635 pounds. Gross weight, 3,050 pounds.



Performance: High speed, 145 miles per hour. Cruising speed, 120 miles per hour. Gasoline capacity, 70 gallons.

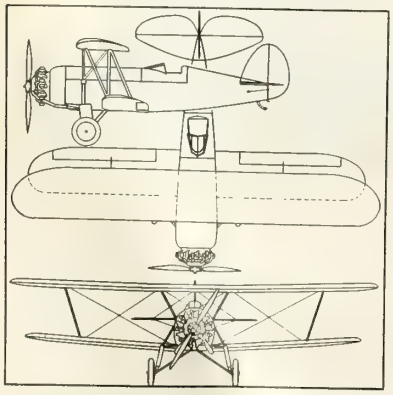
The Mailwing Model PA-7 went through a successful period of service in mail carrying work and was then modified slightly for the use of sportsmen. The modifications consisted principally the conversion of the mail-carying compartment to a side-by-side passenger compartment of two - place capacity.

The outstanding feature of the fuselage skeleton is the use of square section chrome-molybdenum tubing for longerons, this construction permitting of simpler and more effective welded joints. Ailerons are unusually large in area, extending the greater part of the span. The tail surfaces are of welded steel tube construction, fabric covered. The wing construction is conventional, the spars and ribs being made of wood, fabric covered. The usual internal drag bracing is employed. The landing gear is conventional. A short hydraulic shock absorber strut carries the load to a tripod which projects from the longerons of the fuselage. The tail skid is suspended by the installation of a Rusco aero ring, permitting convenient servicing.



PITCAIRN
PA-8 MAILWING
Pitcairn Aircraft Company, Inc.
Willow Grove, Pennsylvania

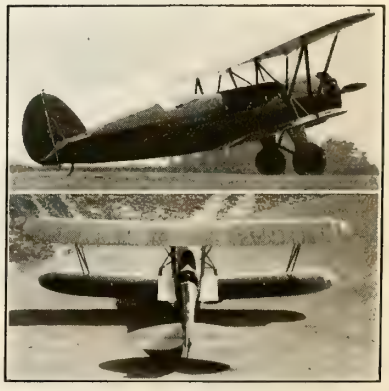
Specifications: Span, upper wing, 35 feet; lower wing, 32 feet. Length overall, 24 feet, 9.5 inches. Height overall, 9 feet. Wing area (including ailerons), 278 square feet. Power loading, 13.33 pounds per horsepower. Wing loading, 14.4 pounds per square foot. Wright J-6 300 horsepower. Weight empty, 2,270 pounds; payload, 1,000 pounds; gross weight, 4,000 pounds.



Performance: High speed, 150 miles per hour. Cruising speed, 120 miles per hour. Gasoline capacity, 80 gallons.

The Mailwing PA-8 is convertible from a straight mail carrying job to one carrying two passengers and 400 pounds of mail. The fuselage is of welded chrome-molybdenum steel, rust-proofed inside and out, and is fabric covered. The powerplant unit is easily removable and interchangeable. Zipper openings, inspection doors and celluloid windows facilitate maintenance. The tail surfaces are of welded steel tube construction, fabric covered. The wing construction is conventional; the spars and ribs are of wood construction.

The landing gear is equipped with a short hydraulic shock absorber strut which carries the load to a tripod which projects from the longerons of the fuselage. The wheels are equipped with brakes which are designed to hold the plane in position while the engine is raced for warming-up. The tail skid is suspended by a simple installation of a Rusco aero ring. Propeller is metal, with adjustable pitch. The instrument equipment is unusually complete, including all night flying equipment. The mail compartment is lined with duralumin and is equipped with lights.



GILMORE OIL PRODUCTS
MONARCH OF ALL

GILMORE AGAIN!



GILMORE SURFACING USED ON LINDBERGH FIELD SAN DIEGO, CALIFORNIA

WHEREVER progressive principals of airport construction and operation are employed, there you will find take off runways and landing areas surfaced by Gilmore Methods with Gilmore special Asphaltic petroleum products.

Gilmore surfaced airports are models of economy and safety. That is why Gilmore products were used in the surfacing of the new Lindbergh Field at San Diego, California.

Air transport companies, private flying field owners and municipal authorities can obtain facts on practical airport surfacing by addressing Gilmore Oil Company, 2423 East 28th Street, Los Angeles, California.

GILMORE
SPECIAL ASPHALTIC
AIRPORT OILS

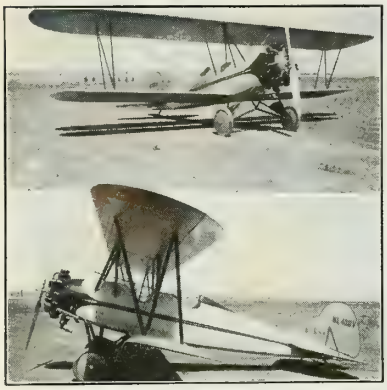
1260-A

REARWIN

KEN-ROYCE 2000-C and 2000-CO

Rearwin Airplanes, Inc.
Kansas City, Kansas

Specifications: Span, upper wing, 35 feet; lower wing, 31 feet 6 inches. Length overall, 25 feet. Height overall, 9 feet 11 inches. Wing area (including ailerons), 300 square feet. Models 2,000-C and 2,000-CO, respectively, powered with Curtiss Challenger 185 horsepower; Continental 165 horsepower. Power loadings, 12.8; 14.2 pounds per horsepower. Wing loadings, 7.9; 7.8 pounds per square foot. Weights empty, 1,495; 1,447 pounds. Useful loads, 885; 912 pounds. Gross weights, 2,380; 2,359 pounds. Performance: High speeds, 138; 135 miles per hour. Cruising speeds, 115; 112 miles per hour. Landing speeds, 35; 35 miles per hour. Rates of climb, 1,000; 950 feet per minute. Service ceilings, 22,600; 21,000 feet. Radii, 500; 500 miles. Gasoline capacities, 55; 55 gallons.

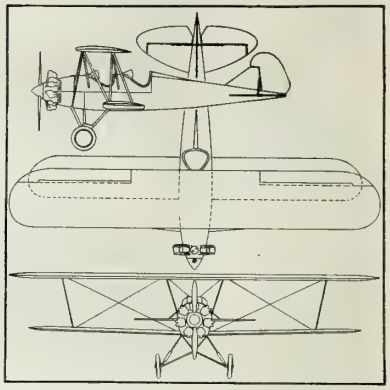


The framework of the fuselage is constructed of welded chrome-molybdenum and carbon steel tubing. Ailerons are Frise type, on upper wings only. Tail surfaces are of welded steel channels and tubes. The framework of the wings is of wood; leading edge is spruce covered with birch plywood; trailing edge of duralumin; wing tips of curved steel tubing; wing fittings cadmium plated. Wings are covered with fabric.

The landing gear is fitted with Bendix wheels and brakes and Rearwin rubber-oil shock absorbers. Instruments are Pioneer.

The Rearwin Ken-Royce is a three-place open-cockpit biplane. Controls are dual. Equipment includes safety belts, parachute-type seats, leather upholstering and metal propeller.

For additional information see advertisement on page 117 of this issue

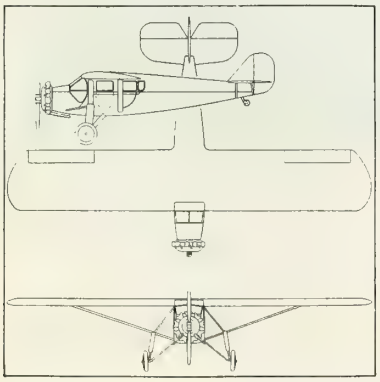


RYAN

BROUGHAM B-5

Detroit Aircraft Corporation
Detroit, Michigan

Specifications: Span, 42 feet 4 inches. Length overall, 28 feet 3 inches. Height overall, 9 feet 10 inches. Wing area (including ailerons), 272 square feet. Wright J-6 Whirlwind 300 horsepower. Power loading, 13.33 pounds per horsepower. Wing loading, 14.71 pounds per square foot. Weight empty, 2,251 pounds; gross weight, 4,000 pounds.



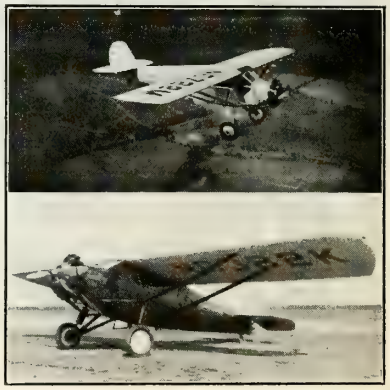
Performance: High speed, 138 miles per hour. Cruising speed, 110 miles per hour. Rate of climb, 1,000 feet per minute. Service ceiling, 16,000 feet. Radius, 710 miles. Gasoline capacity, 100 gallons.

The framework of the fuselage is of welded steel tubing covered with sewed fabric. The ailerons and tail surfaces are conventional. The framework of the wings is of wood construction, continuous spar, one panel spruce, glued, covered with sewed fabric.

The landing gear is of the conventional split-axle type, equipped with oleo struts and Bendix wheels and brakes. Landing gear tread is 120 inches. Pneumatic tail wheel is provided. Starter is Eclipse hand inertia and propeller is Hamilton-Standard. Standard flight, navigation and engine instruments are provided.

The Ryan Brougham accommodates six persons and twenty cubic feet of baggage. Doors are provided on the right and left sides of the ship.

Controls are dual, side by side. The tail surfaces are cable controlled. The Ryan B-5 has been issued an Approved Type Certificate by the Dept. of Commerce, covering Edo float installation for operation on the water.



SIKORSKY

S-38-B AMPHIBION

Sikorsky Aviation Corporation,
Bridgeport, Connecticut

Specifications: Span, upper wing, 71 feet 8 inches; span, lower wing, 36 feet. Length overall, 40 feet 3 inches. Height overall, 13 feet 10 inches. Wing area (including ailerons), 720 square feet. Two Pratt & Whitney Wasps totaling 840 horsepower. Power loading, 12.3 pounds per horsepower. Wing loading, 14.3 pounds per square foot. Weight empty, 6,500 pounds; useful load, 3,980 pounds; gross weight, 10,480 pounds.



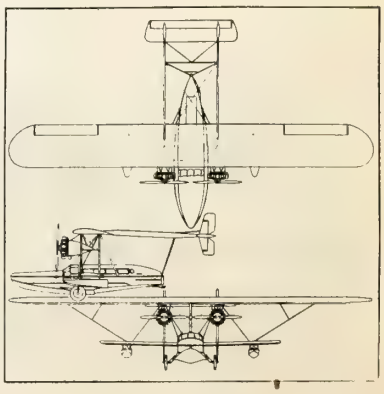
Performance: High speed, 125 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 55 miles per hour. Rate of climb, 750 feet per minute. Climb in 10 minutes, 7,500 feet. Service ceiling, 18,000 feet. Radius, 600 miles. Gasoline capacity, 330 gallons.

Six watertight compartments are incorporated in the construction of the fuselage, which is built of wooden frames and covered with riveted Alcad. Hydraulic retractable landing gear, equipped with oleo and spring shock absorbers, semi-balloon tires and hydraulic brakes, is provided.

The ship accommodates 12 persons. Seating arrangement is optional. A front compartment holds 200 pounds of baggage. Throwover dual controls, a hand inertia or electric starter and a standard instrument panel are included in the equipment. The propeller is Hamilton-Standard.

The Sikorsky S-38-B Amphibion holds world's records for speed and altitude with loads as follows: Altitude with 1,000 kilograms payload and with 2,000 kilograms payload; speed for 100 kilometers with 2,000 kilograms payload.

For additional information see advertisement on page 119 of this issue





ANNOUNCING
THE *NEW*
REARWIN JUNIOR!

REARWIN JUNIOR FACTS

Conventional design
Perfect up and forward visibility
Easily entered with parachutes
Roomy and comfortable
Luggage space
Dual controls
Stabilizer adjustable from either seat
72 inch landing gear, shocks, semi-air wheels
A plane in a class by itself.

DIMENSIONS

Length	21 ft. 8 in.
Span	36 ft.
Height	7 ft. 6 in.
Surface area, total	182 sq. ft.

PERFORMANCE

Take-off	7 seconds
Landing speed	25 m.p.h.
Climb	700 ft. first minute
Cruising speed	85 m.p.h.
Top speed	100 m.p.h.
Cruising radius	500 miles
Gas consumption	2¾ gals. p.h.

DEALERS

The low price of the Rearwin Junior will make it sell rapidly. Backed by Rearwin Airplanes, Inc., financial stability is assured.

A Light Two-Place Monoplane of Sensational Advancement!

BUILT by Rearwin Airplanes, Inc., builders of the famous Rearwin Ken-Royce, the new Rearwin Junior fills a long felt want in aviation.

A chummy, two-place airplane of remarkably sturdy construction — the Junior weighs about 500 pounds empty. Equipped with a forty-five h.p., three cylinder motor of almost unbelievable performance and economy.

Ideal for cross country flying. A real ship that gets out and "goes places" — not a power glider. Veteran pilots will be amazed at the performance of this ship. One can learn to fly in much less time than ordinarily required on larger ships and at a very low price. A slow landing speed makes the Rearwin Junior extremely safe and ideal for training.

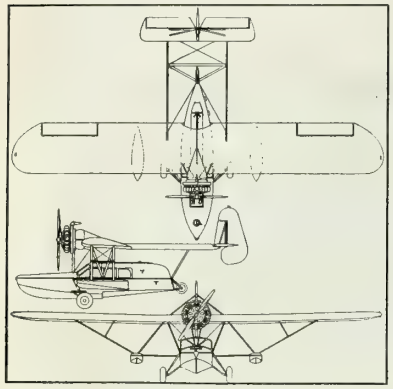
Upkeep is very nominal. The low price of the Rearwin Junior will be announced at the Detroit Air Show and will assure instant success. If you are interested in securing a dealer franchise on this new ship or for private use, write or wire at once.

REARWIN AIRPLANES, Inc.

FAIRFAX AIRPORT KANSAS CITY

SIKORSKY
S-39-B AMPHIBION
Sikorsky Aviation Corporation, Bridgeport, Connecticut

Specifications: Span, 52 feet. Length overall, 31 feet 11 inches. Height overall, 11 feet 8 inches. Wing area (including ailerons), 350 square feet. Pratt & Whitney Wasp, Junior, of 300 horsepower. Power loading, 13.33 pounds per horsepower. Wing loading, 11.43 pounds per square foot. Weight empty, 2,678 pounds; useful load, 1,322 pounds; gross weight, 4,000 pounds.



Performance: High speed, 119 miles per hour. Cruising speed, 100 miles per hour. Landing speed, 54 miles per hour. Rate of climb, 750 feet per minute. Climb in 10 minutes, 7,500 feet. Service ceiling, 18,000 feet. Radius, 450 miles. Gasoline capacity, 65 gallons.

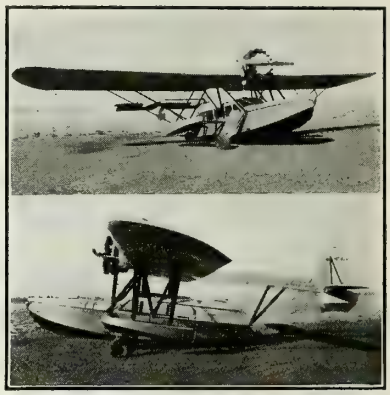
Five watertight compartments are incorporated in the construction of the fuselage, the framework of which is duralumin covered with riveted Alclad. The wings and tail surfaces have a duralumin framework covered with fabric. Ailerons are of the balance type with push pull tubes. Aileron framework is duralumin covered with fabric. Hydraulic retractable landing gear, equipped with Goodyear Airwheels, hydraulic brakes and shock absorbers, is provided.

Equipment includes Hamilton-Standard aluminum alloy propeller, Heywood starter, standard instrument panel, Sperry Artificial Horizon, Paulin altimeter and life preservers.

The Sikorsky S-39-B Amphibion accommodates five persons. Controls are dual.

The single engine is mounted at the leading edge of the wing.

For additional information see advertisement on page 119 of this issue



SIKORSKY
S41 AMPHIBION
Sikorsky Aviation Corporation, Bridgeport, Connecticut

Specifications: Span, 78 feet 9.25 inches. Length overall, 45 feet 2.75 inches. Height overall, 15 feet 3.55 inches. Wing area (including ailerons), 729 square feet. Two Pratt & Whitney Hornet B's totaling 1,150 horsepower. Power loading, 10.8 pounds per horsepower. Wing loading, 17.1 pounds per square foot. Weight empty, 7,500 pounds; useful load, 5,000 pounds; gross weight, 12,500 pounds.

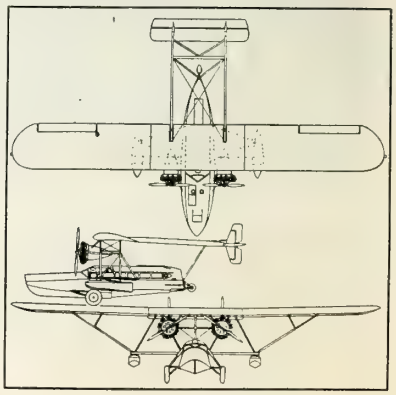


Performance: High speed, 125 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 61.5 miles per hour. Rate of climb, 750 feet per minute. Climb in 10 minutes, 7,500 feet. Service ceiling, 16,500 feet. Radius, 600 miles. Gasoline capacity, 450 gallons.

Five watertight compartments are incorporated in the construction of the fuselage, which has a framework of duralumin covered with riveted Alclad. Wings, ailerons and tail surfaces have a duralumin framework covered with fabric. Hydraulic retractable landing gear, equipped with oleo and spring shock absorbers, semi-balloon tires and hydraulic brakes, is provided. Propeller is Hamilton-Standard, starter is hand inertia or electric, instrument panel is standard and special instruments are provided according to requirements.

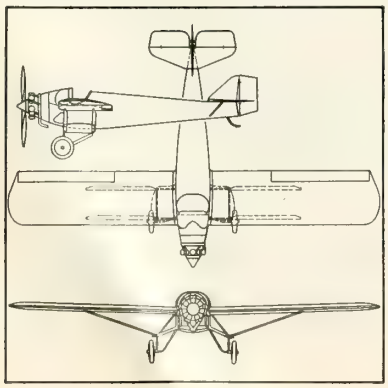
The Sikorsky S-41 Amphibion accommodates a total of 16 persons, including crew. Baggage accommodations are provided in a front compartment. A total of 200 pounds of baggage may be carried. The seating arrangement is optional. Throwover dual controls are provided.

For additional information see advertisement on page 113 of this issue



SIMPLEX
RED ARROW, W-2-S
Simplex Aircraft Corporation, Defiance, Ohio

Specifications: Span, 34 feet 4 inches. Length overall, 22 feet. Wing area (including ailerons), 150 square feet. Power loading, 16,16 pounds per horsepower. Wing loading, 11.85 pounds per square foot. Warner Scarab 110 horsepower. Weight empty 1,152 pounds. Useful load, 627 pounds. Gross weight, 1,779 pounds.



Performance: High speed, 125 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 38 miles per hour. Rate of climb, 1,000 feet per minute. Climb in 10 minutes, 6,500 feet. Service ceiling, 16,000 feet. Radius, 600 miles. Gasoline capacity, 44 gallons.

The framework of the fuselage is constructed of chrome-molybdenum welded tubing covered with Flightex. The ailerons and tail surfaces have a framework of steel tubing, Flightex covered. The framework of the wings is of box spar and wood rib construction, fabric covered. Landing gear is constructed of heat treated chrome-molybdenum tubing and is of the split-axle type. Propeller provided is Supreme or Hartzell, with Hamilton-Standard available on special order. Shock absorbers are oil-draulic. The tires are 26 inches by four inches; Airwheels are special. The instrument panel is equipped with tachometer, altimeter, oil pressure and temperature gauges and may be fitted with other instruments on order. Other accessories included are navigation lights, fire extinguisher and log books.

The Simplex Red Arrow is a center wing monoplane. Two persons, including pilot, are accommodated. Side-by-side wicker chairs and dual controls are provided.



TEN THOUSAND TEST FLIGHTS



IN THE EVOLUTION OF THE *SIKORSKY S-38*

Over a period of two years, pilots of the Sikorsky S-38 have cooperated with the engineering department of the Sikorsky Aviation Corporation by suggesting refinements of detail and improvements of design, making for greater safety, efficiency and passenger comfort in actual operation. Thus the S-38 has had more than 10,000 practical "test flights" under exacting field conditions. Engineers and pilots of Pan American Airways, which operates a fleet of Sikorsky Amphibions in the West Indies, Central and South America, have made many valuable suggestions, ninety-two of which have been adopted. These valuable improvements are now incorporated in the 1931 model S-38, and most of them are found in other Sikorsky Amphibions —the 5-place S-39, the 16-passenger S-41 and the new 40-passenger S-40.



Capt. Boris Sergievsky, who has established several world's records in Sikorsky Amphibions

A few of the improvements suggested by Pan American operation are:

- Rubber walk-way on wing replaced by quartz
- Stanchion posts of monel metal to prevent corrosion
- Hydraulic brakes
- Gasoline capacity increased to 330 gallons
- Control wires in cockpit covered
- Master ignition switch installed
- Engine nose cowlings split for easy removal
- Navy towing attachment installed in addition to present system
- Instrument wiring changed to prevent compass deviation
- Additional steps installed on landing gear
- Overhead air intake with scoop installed

Powered with two 420 H. P. Wasp engines, the S-38 flies ten persons at a cruising speed of 110 miles per hour. Equally adaptable to land or water operation. An exceptionally high type of amphibion airplane for executive transport. Sikorsky Aviation Corporation, Bridgeport, Connecticut. Division of United Aircraft & Transport Corporation.

VISIT THE SIKORSKY EXHIBIT AT THE DETROIT AIRCRAFT SHOW

WORLD'S RECORD FOR SPEED WITH LOAD

SIKORSKY AMPHIBION

WORLD'S RECORD FOR ALTITUDE WITH LOAD

SOLAR

MS-1

Solar Aircraft Company, Ltd.
San Diego, California

Specifications: Span, upper wing, 56 feet 6 inches; lower wing, 18 feet. Length overall, 35 feet 11 inches. Height overall, 10 feet 2 inches. Wing area (including ailerons), 496.5 square feet. Pratt & Whitney Wasp C 425 horsepower. Power loading, 13.3 pounds per horsepower. Wing loading, 11.4 pounds per square foot. Weight empty, 3,500 pounds; useful load, 2,150 pounds; gross weight, 5,650 pounds.

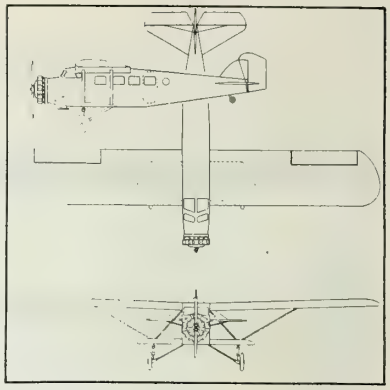


Performance: High speed, 125 miles per hour. Cruising speed, 112 miles per hour. Landing speed, 50 miles per hour. Rate of climb, 800 feet per minute. Climb in 10 minutes, 6,500 feet. Service ceiling, 17,000 feet. Radius, 500 miles. Gasoline capacity, 110 gallons.

The fuselage is semi-monocoque and has a framework of duralumin covered with corrugated duralumin. The framework of ailerons and tail surface is of duralumin covered with corrugated duralumin. The Gott. 398 Airfoil is used. Duralumin ribs and box spars are incorporated in the construction of the wings which are covered with duralumin.

The landing gear is of the split-axle type and is constructed of chrome-molybdenum. Equipment includes Gruss type-B-68 shock absorbers, Goodrich tires, Bendix brakes, Hamilton aluminum alloy propeller, Eclipse starter and Pioneer instrument panel. Landing lights are optional. The exhaust collector ring is of stainless steel.

The Solar MS-1 accommodates eight persons. Seats are arranged facing forward with a center aisle. A baggage compartment is located aft of the passengers' cabin. Single or dual control is provided.

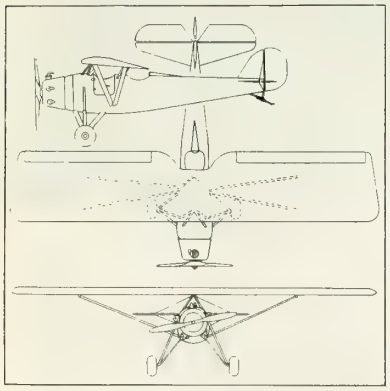


STATES

B-3

States Aircraft Corporation,
Chicago Heights, Illinois

Specifications: Span, 32 feet. Length overall, 22 feet. Height overall, 7 feet 10 inches. Wing area (including ailerons), 192 square feet. Kinner K-5 100 horsepower. Power loading, 16.35 pounds per horsepower. Wing loading, 8.5 pounds per square foot. Weight empty, 1,083 pounds; useful load, 552 pounds; gross weight, 1,635 pounds.

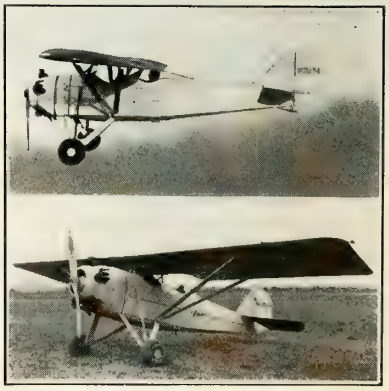


Performance: High speed, 105 miles per hour. Cruising speed, 90 miles per hour. Landing speed, 35 miles per hour. Rate of climb, 900 feet per minute. Climb in 10 minutes, 9,000 feet. Service ceiling, 14,000 feet. Gasoline capacity, 24 gallons. Radius, 405 miles.

An all-metal welded fuselage covered with fabric is provided. The ailerons are Frize type. Tail surfaces are constructed of welded metal covered with fabric. Wings are built of wood, fabric covered. Fittings are steel. The landing gear is equipped with oleo shock absorbers and Airwheels. Starter and brakes are optional. A Consolidated instrument panel is provided. Special instruments and other accessories are optional. The landing gear is heat treated tensile strength 1040.

Two persons are accommodated. The seating arrangement is in tandem. A baggage compartment locker is installed in the front cockpit. The controls are dual. A chrome plated control stick and throttle, roller bearing control shaft and stick control stops are provided. The cabin is upholstered in leather. The seat arm rests are upholstered. The seat cushions are overstuffed. The flooring is pyramid aluminum. Propeller is Hamilton-Standard or Hartzell wood.

For additional information see advertisement on page 19 of this issue



STEARMAN

CLOUDBOY 6A

Stearman Aircraft Company
Wichita, Kansas

Specifications: Span, upper wing, 32 feet; lower wing, 28 feet. Length overall, 24 feet 8 inches. Height overall, 9 feet 7 inches. Wing area, (including ailerons), 272.2 square feet. Power loading, 14.54 pounds per horsepower. Wing loading, 8.9 pounds per square foot. Wright R-540 of 165 horsepower. Weight empty, 1,733 pounds; Useful load, 667 pounds; Gross weight, 2,400 pounds.



Performance: High speed, 110 miles per hour. Cruising speed, 87 miles per hour. Landing speed, 45 miles per hour. Rate of climb, 710 feet per minute. Climb in 10 minutes, 5,600 feet. Service ceiling, 12,300 feet. Radius, 395 miles. Gasoline capacity, 37 gallons.

The fuselage is of steel tube construction, fabric covered. The ailerons are of steel tubing, metal covered, and are used on both upper and lower wings. They are Frise type. The tail surfaces are of steel tubing fabric covered. The wings are of spruce and plywood covered with fabric. Tubular adjustable struts are used between the wings. The gasoline supply is carried in a center section tank.

The landing gear is of the divided type and is equipped with Bendix brakes. Shock absorbers are oil and steel spring. A Hamilton-Standard propeller is used. The instrument panel is equipped with Pioneer instruments.

The Cloudboy accommodates two persons, in a tandem seating arrangement. The seats are arranged for standard parachute packs. The controls are dual.

Staggered wings and a cutaway in the upper wing center section facilitate visibility.

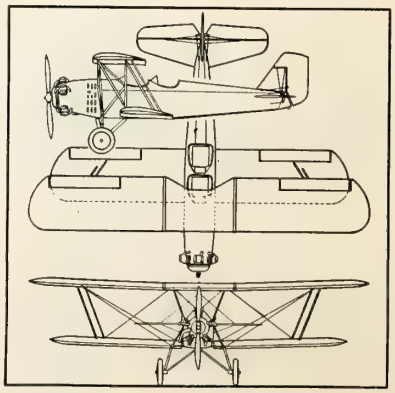




Photo by R. B. Hoyt

. . . with SOCONY

GIVE 'ER THE GUN . . . she's on the "step"! That's all there's to it when you use a fuel you can depend on—a fuel with plenty of ready power like Socony Aviation Gasoline.

Whether you pilot a seaplane, a land-plane, or an amphibian, you can always depend on Socony Aviation Gasoline and the New Socony Motor Oil for a care-free take-off. Use them next time and convince yourself.

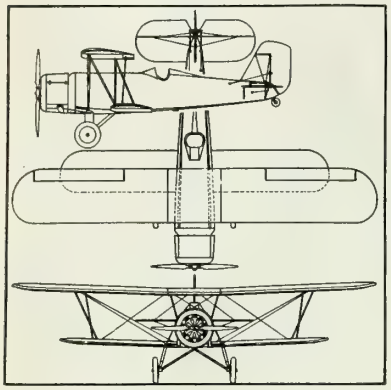
SOCONY

Socony Aviation Gasoline **New Socony Motor Oil**

STANDARD OIL COMPANY OF NEW YORK

STEARMAN
JUNIOR SPEEDMAIL 4D
Stearman Aircraft Company
Wichita, Kansas

Specifications: Span, upper wing, 38 feet; lower wing, 28 feet. Length overall, 26 feet, 11 inches. Height overall, 10 feet 2 inches. Wing area, (including ailerons), 307 square feet. Power loading, 12.66 pounds per horsepower. Wing loading, 12.37 pounds per square foot. Pratt & Whitney, Wasp Jr., 300 horsepower. Weight empty, 2,297 pounds; useful load, 1,503 pounds; gross weight, 3,800 pounds.



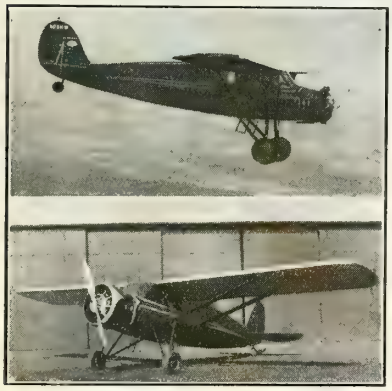
Performance: High speed, 143 miles per hour. Cruising speed, 115 miles per hour. Landing speed, 50 miles per hour. Climb in 10 minutes, 6,875 feet. Service ceiling, 15,000 feet. Radius, 815 miles. Gasoline, capacity, 106 gallons. Rate of climb, 1,000 feet per minute.

The fuselage is constructed of steel tubing covered with fabric. The mail compartment is located forward of the front passenger's seat. The ailerons are of spruce and plywood, fabric covered. They are Frise type and are located on the upper wing only. They are operated by external auxiliary struts through push rods through the lower wing. The tail surfaces are of steel tubing, fabric covered. The rudder is balanced. The wings are of spruce and plywood, fabric covered. The N struts between the wings are adjustable. The landing gear is of the split-axle type and is equipped with standard wheel brakes. The tail wheel is placed at the extreme rear of the fuselage. The propeller is Hamilton-Standard. Shock absorbers are oil and steel springs. A Pioneer instrument panel is used. The Junior Speedmail accommodates three persons, including the pilot. An N. A. C. A. cowling is provided.



STINSON
JUNIOR
Stinson Aircraft Corporation
Wayne, Michigan

Specifications: Span, 41 feet 8 inches. Length overall, 28 feet 11 inches. Height overall, 8 feet 9 inches. Wing area (including ailerons), 234 square feet. Models SM-8A, SN-7B, respectively, Lycoming R-680 215 horsepower, Pratt & Whitney Wasp, Junior, 300 horsepower. Power loadings, 14.9; 11.65 pounds per horsepower. Wing loadings, 13.68; 14.95 pounds per square foot. Weights empty, 2,061; 2,312 pounds. Useful loads, 1,139; 1,188 pounds. Gross weights, 3,200; 3,500 pounds.



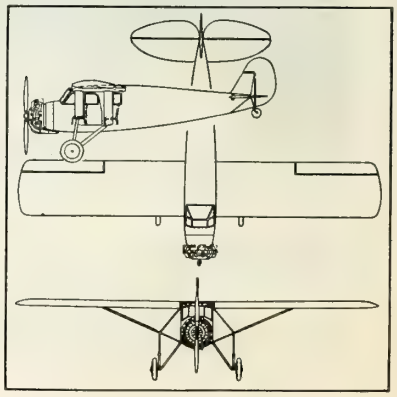
Performance: High speeds, 122; 131 miles per hour. Cruising speeds, 98; 113 miles per hour. Landing speeds, 52; 54 miles per hour. Rates of climb, 685; 900 feet per minute. Service ceiling, 12,000; 15,000 feet. Endurance, 5.2; 3.62 hours. Gasoline capacities, 60 gallons.

The fuselage framework is constructed of chrome-molybdenum and mild carbon steel tubing, welded and covered with fabric. Aileron framework is built of stamped steel ribs and steel tube spar.

Chrome-molybdenum heat treated steel tubing is used in the construction of the landing gear, which is equipped with oleo shock absorbers and brakes, both made by Stinson. Semi-balloon tires are optional.

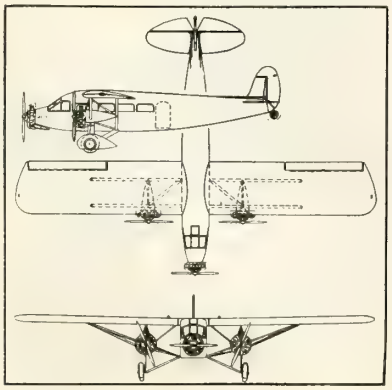
Equipment includes Hamilton-Standard propeller, Eclipse electric starter, Pioneer instruments, 8.50-inch by 10-inch rubber tires. Model SM-8A has been issued an A.T.C. with Edo floats. Each ship accommodates three persons and 50 pounds of baggage. A cabin heater is included in the equipment.

For additional information see advertisement on pages 20-21 of this issue



STINSON
AIRLINER SM-6000
Stinson Aircraft Corporation
Wayne, Michigan

Specifications: Span, 60 feet. Length overall, 42 feet 10 inches. Height overall, 12 feet. Wing area (including ailerons), 490 square feet. Three Lycoming R-680's totaling 645 horsepower. Power loading, 13.32 pounds per horsepower. Wing loading, 17.5 pounds per square foot. Weight empty, 5,670 pounds. Useful load, 2,930 pounds. Gross weight, 8,600 pounds.



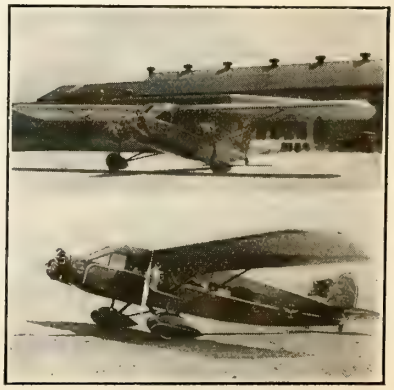
Performance: High speed, 135 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 60 miles per hour. Rate of climb, 1,060 feet per minute. Climb in 10 minutes, 6,500 feet. Service ceiling, 14,200 feet. Endurance, 3.5 hours. Gasoline capacity, 120 gallons.

The framework of the fuselage is constructed of chrome-molybdenum steel tubing, welded, covered with fabric. The aileron framework is built of stamped ribs and steel tube spar. Tail surfaces are constructed of mild carbon and chrome-molybdenum steel tubing, welded. The framework of the wings is built of chrome-molybdenum steel tube spars, welded, duralumin ribs and steel drag wires.

The landing gear is equipped with heat-treated chrome-molybdenum steel tube axle, Aerol struts and Bendix brakes. Equipment includes Hamilton-Standard propeller, Eclipse electric starter, Pioneer instruments, tail wheel, landing lights, radio receiver, antennae, flares, fire extinguisher, cabin ventilators, speed rings.

The ship accommodates 11 persons and 225 pounds of baggage. Single or dual control and wheel fairings are optional.

For additional information see advertisement on pages 20-21 of this issue



LAIDLAW CABIN UPHOLSTERY

SUPPLIES ALL AVIATION'S TEXTILE NEEDS

Broadcloths, Bedford Cords, fancy Rayons and Cottons in a large variety of colorings, patterns and weaves for cabin seats, walls and ceilings; also carpets for floor coverings. All textiles in harmony, producing

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Write for our new samples, Collection No. A-31

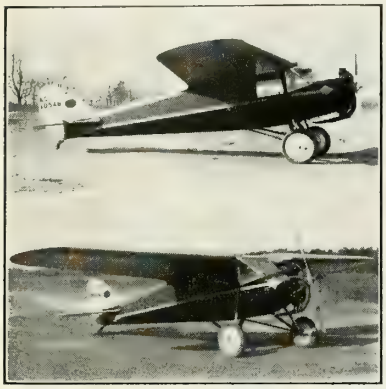
THE LAIDLAW CO., Inc.
NEW YORK

DETROIT CHICAGO ST. LOUIS LOS ANGELES

MILLS AT PHILADELPHIA, PA., AND PAWTUCKET, R. I.

SWANSON
COUPE W-15
Swanson Aircraft Company, Inc., Hopewell, Virginia

Specifications: Span, 34 feet 4 inches. Length overall, 25 feet. Height overall, 7 feet 7 inches. Wing area (including ailerons), 180 square feet. Power loading, 18.65 pounds per horsepower. Wing loading, 10.95 pounds per square foot. Warner Scarab 110 horsepower. Weight empty 1,325 pounds. Useful load, 725 pounds. Gross weight, 2,050 pounds.

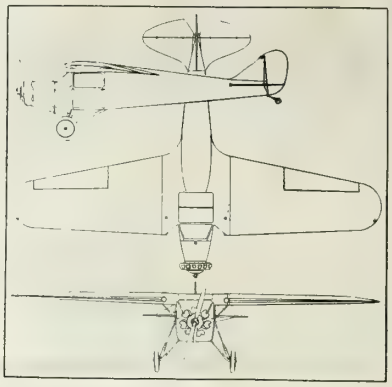


Performance: High speed 125 miles per hour. Cruising speed, 95 miles per hour. Landing speed, 40 miles per hour. Rate of climb, 1,000 feet per minute. Service ceiling, 16,000 feet. Radius, 625 miles. Gasoline capacity, 40 gallons.

The fuselage is constructed of welded alloy steel tubing, incorporating Swanson patent wing truss, and is aluminum-covered to rear of cabin. Fabric covering is Grade A Dartmouth-Tex. The ailerons are of conventional wood construction, swung on Fafnir ball bearings. Tail surfaces are of welded steel. The spars of the full cantilever wing are constructed of built-up box sections, spruce mahogany planked. The landing gear is of the split-axle type, with Oildraulic struts. Aircraft Products or Goodyear Airwheels are optional.

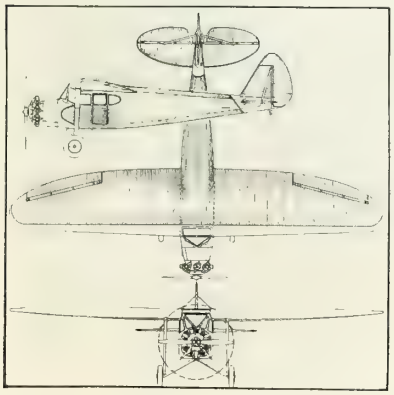
The plane is equipped with a Paragon wood propeller (standard model) and Hamilton-Standard (DeLuxe model). Tires are U. S. or Goodyear. The plane is equipped with Eclipse direct cranking starter, Elgin instruments, Pyrene fire extinguisher, first aid kit, tool kit, navigation lights, landing lights, and interior lighting. It accommodates two persons with baggage.

For additional information see advertisement on page 207 of this issue



THADEN T-4
PITTSBURGH
Pittsburgh Metal Airplane Company Pittsburgh, Pennsylvania

Specifications: Span, 45 feet. Length overall, 32 feet 10 inches. Height overall, 9 feet. Wing area (including ailerons), 304 square feet. Power loading, 12.67 pounds per horsepower. Wing loading, 12.5 pounds per square foot. Weight J-6 of 300 horsepower. Weight empty, 2,365 pounds; useful load, 1,435 pounds; gross weight, 3,800 pounds.



Performance: High speed, 135 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 59 miles per hour. Rate of climb, 920 feet per minute. Gasoline capacity, 96 gallons.

The fuselage is full monocoque construction with Alclad. The covering is corrugated, with the exception of the cowling up to the pilot's cockpit, which is smooth covering. The ailerons are Frise type, of Alclad construction, and are set back from the tip of the wing. Ball-bearing hinges and differential controls are used. The tail surfaces are semi-cantilever, Alclad covered; the hinges are ball bearing. The wings are full cantilever monocoque box type with Alclad covering, the leading edge of which is smooth metal and the remainder corrugated. The trailing edge is elliptic in shape. All parts of the interior of the wing are accessible for inspection. A spreader-type landing gear is used, equipped with Bendix wheels and brakes, oleo and ring spring shock obsorber.

The propeller is Hamilton-Standard. The shock absorbers are Edgewater. The plane is equipped with Goodyear tires, Eclipse inertia starter, and Pioneer instruments.

The Thaden accommodates four persons. Baggage accommodations allow for 119 pounds of baggage. Dual control are used.



TOWLE
TA-3 AMPHIBION
Towle Aircraft Company, Inc., Detroit, Michigan

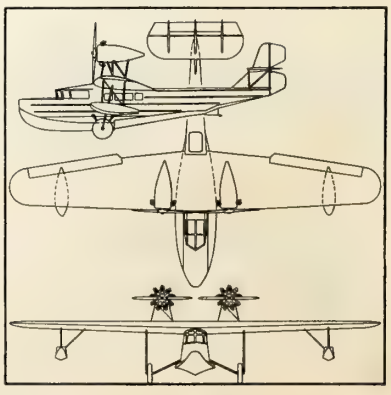
Specifications: Span, 56 feet. Length overall, 42 feet. Height overall, 14 feet. Wing area (including ailerons), 406 square feet. Powered with two Packard Diesels totaling 450 horsepower (Wasp, Juniors or Wrights of 240 horsepower or 300 horsepower). Power loading, 13.2 pounds per horsepower. Wing loading, 15.28 pounds per square foot. Weight empty, 3,943 pounds. Useful load, 2,257 pounds. Gross weight, 6,200 pounds.



Performance: High speed, 120 miles per hour. Cruising speed, 100 miles per hour. Landing speed, 55 miles per hour. Rate of climb, 800 feet per minute. Service ceiling, 15,000 feet. Radius, 500 miles. Fuel capacity (fuel oil) 90 gallons.

The Towle Amphibion is an all-metal ship. The hull is of all-Alclad metal, riveted throughout. High bow and concave Vee bottom with two step and tail skid behind and adjacent to rear step are incorporated in construction. Covering is sheet metal Alclad. All-metal ailerons are covered with corrugated Alclad. Tail surfaces include three rudders, three fins, one adjustable stabilizer and one large elevator, all ball bearing. Wings are all metal, covered with corrugated Alclad. Landing gear has mechanical retraction, visible and positive locking and ball bearing. Brakes are Bendix. Propeller is Hamilton-Standard, starter is electric and hand inertia combined, and instrument panel is Pioneer. Equipment includes electric tachometers.

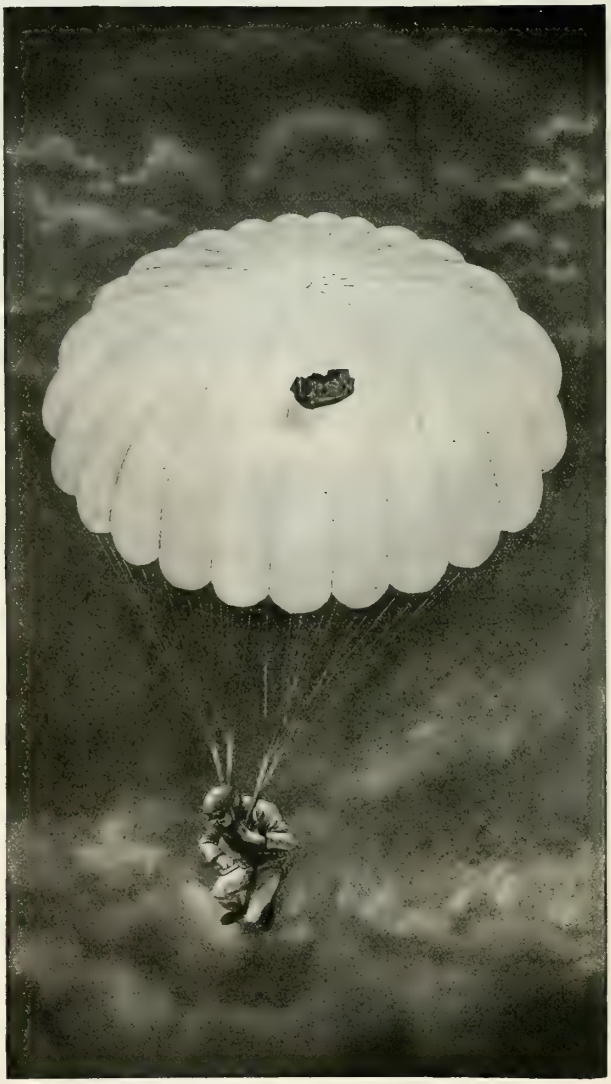
The pilot and co-pilot are seated forward in a compartment in which maximum visibility is provided. The pilots' seats are of the bucket type, upholstered with leather.



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SAFETY CHUTES
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$300
FOR WHITE SILK

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Pilots:—Here is the greatest value in Aviation today. A proved superior SWITLIK SAFETY CHUTE (with the famous patented combination pack cover and pilot chute) at a saving of $75.00. Here is the chute that is smaller, lighter, more compact, perfectly smooth, really comfortable to wear, and of proved quicker opening—at a lower price than you would pay for an ordinary chute. Every SWITLIK CHUTE is drop tested and approved with A. T. C. Wire or write at once.

SEE THE SWITLIK SAFETY CHUTE EXHIBITED AT THE NATIONAL AIRCRAFT SHOW, DETROIT

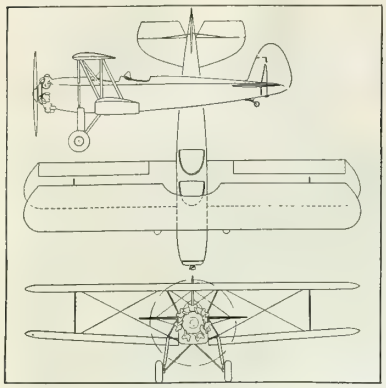
Department of Commerce Officials—Air Mail Pilots and Famous Flyers use Switlik Chutes

SWITLIK PARACHUTE & EQUIPMENT CO.
BROAD & DYE STREETS TRENTON, N. J.

WESTERN MANAGER—BERT WHITE — 1223 AIRWAY — GRAND CENTRAL AIR TERMINAL — GLENDALE, CALIF.

VERVILLE
SPORTSMAN A. T.
Verville Aircraft Company, Detroit, Michigan

Specifications: Span, upper wing, 31 feet; lower wing, 31 feet. Length overall, 24 feet 3.5 inches. Height overall, 8 feet 9 inches. Wing area (including alierons), 242.5 square feet. Power loading, 13.5 pounds per horsepower. Wing loading, 9.25 pounds per square foot. Continental 165 horsepower. Weight empty, 1,560 pounds. Useful load, 680 pounds. Gross weight, 2,240 pounds.

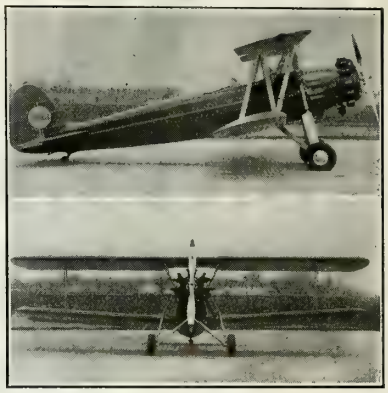


Performance: High speed, 115 miles per hour. Cruising speed, 90 miles per hour. Landing speed, 50 miles per hour. Rate of climb, 700 feet per minute. Climb in 10 minutes, 6,000 feet. Gasoline capacity, 36 gallons.

The fuselage is constructed of chrome-molybdenum tubing, Pratt truss. The covering is of Grade A cotton fabric. The ailerons are constructed of steel stamped ribs, spot welded to a square tubular steel spar. The ailerons are in lower panel only. Tail surfaces are chrome-molybdenum tubing, fabric covered. Wings are of wood ribs and spars. The landing gear is of the split-axle type with oildraulic shock absorber legs.

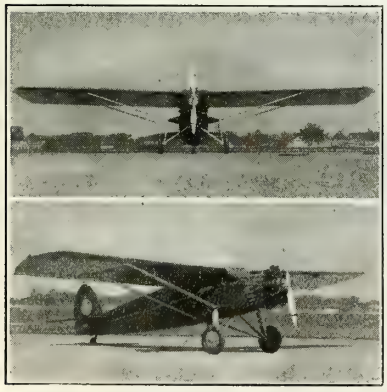
The Sportsman is equipped with Hamilton-Standard propeller. Either Heywood or Eclipse starter is provided. Aircraft Products brakes are used. The instrument panel is equipped with tachometer, air speed, oil pressure, oil temperature, compass, and bank and turn indicators.

The plane is a two-place tandem job. Dual controls and a complete set of instruments for both cockpits are provided. A baggage compartment is provided in the fuselage. Seats accommodate standard type parachutes.



VERVILLE
AIR COACH
Verville Aircraft Company, Detroit, Michigan

Specifications: Span, 44 feet. Length overall, 28 feet 9 inches. Height overall, 8 feet. Wing area (including ailerons), 275 square feet. Power loading, 15.1 pounds per horsepower. Wing loading, 12.4 pounds per square foot. Wright Model R-760-A of 225 horsepower. Weight empty, 2,100 pounds. Useful load, 1,300 pounds. Gross weight, 3,400 pounds.



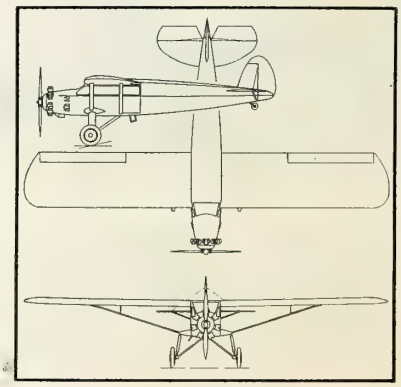
Performance: High speed, 130 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 45 miles per hour. Rate of climb, 1,000 feet per minute. Climb in 10 minutes, 8,000 feet. Service ceiling, 11,000 feet. Radius, 600 miles. Gasoline capacity, 80 gallons.

The fuselage is of chrome-molybdenum steel tubing, fabric covered. The ailerons and tail surfaces are of metal, covered with fabric; the wings are constructed of wooden spars and ribs. The landing gear is of the split-axle type, constructed of heat treated chrome-molybdenum axles, and oleo shock absorbing struts.

The propeller is Hamilton-Standard. The plane is equipped with oildraulic shock absorbers, Eclipse electric inertia starter, Bendix brakes. Tires are 32 inches by six inches. The instrument panel is equipped with air speed indicator, tachometer, oil temperature and pressure indicator, and bank and turn indicator.

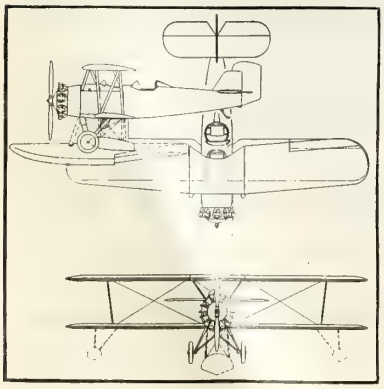
The Air Coach seats four persons, including pilot. Dual controls are provided. Special features are non-shatterable glass windows, removable control wheel, navigation lights, and dome, sidewall and instrument board lights.

Seating is side-by-side tandem.



VOUGHT
CORSAIR
Chance Vought Corporation, East Hartford, Connecticut

Specifications: Span, upper wing, 36 feet; lower wing, 35 feet 6 inches. Length overall, 24 feet 6 inches. Height overall, 10 feet 2 inches. Wing area (including ailerons), 320 square feet. Pratt & Whitney Wasp 425 horsepower. Power loading, 8.6 pounds per horsepower. Wing loading, 11.4 pounds per square foot. Weight empty, 2,365 pounds; useful load, 1,285 pounds; gross weight, 3,650 pounds.



Performance: High speed, 150 miles per hour. Cruising speed, 125 miles per hour. Landing speed, 55 miles per hour. Rate of climb, 1,500 feet per minute. Climb in 10 minutes, 10,200 feet. Service ceiling, 19,000 feet. Radius, 450 miles. Gasoline capacity, 110 gallons.

The Vought Corsair accommodates two persons and hand luggage. Seating arrangement is in tandem. Controls are dual. Plane is convertible to landplane or seaplane by interchange of landing gear.

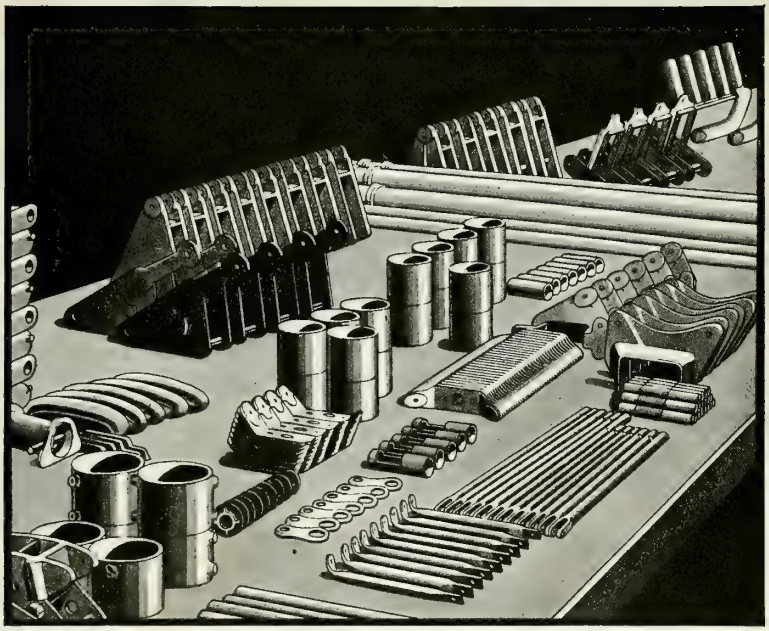
Fuselage framework is built of steel tubes, covered with fabric and aluminum. Ailerons are of wood, fabric covered. Tail surfaces are of steel tubing, fabric covered. The framework of the wings is built of wood, covered with fabric.

The landing gear is equipped with oleo spring, made by the Chance Vought Company, and Bendix brakes. Propeller is Hamilton-Standard. Hand inertia starter is provided. Electrical starter is optional. Instrument panel is special Chance Vought make. Instruments are Pioneer.

The Corsair is used extensively by the U. S. Navy Air Service.

For additional information see advertisement on page 127 of this issue





BUILDING STAMINA INTO CHANCE VOUGHT AIRPLANES

Until a seaplane has to be set down in a rough sea, a pontoon strut fitting is just one of a thousand details. But at the instant of landing, that fitting is either a perfect part or a real menace. There can be no compromise between the two. And so with every one of the hundreds of parts in a reliable airplane. Only by careful selection of materials, by accurate control in fabrication, thorough and frequent inspection . . . all backed by proper design . . . . can such perfection be attained. And every part in a Chance Vought plane is made and tested by that formula.

In the sunlit Vought plant, presses punch out the parts from which built-up fittings are made. Vought-trained mechanics do the welding and brazing. And Vought-trained inspectors watch the work. At every step, each part is subjected to careful check. None but perfect parts get through the many inspections.

All parts in Vought airplanes are designed and built for strenuous service. Vought planes in the Navy take catapult launching and deck landing into arresting gear as all in the day's work, year in and year out. And for sport and business, it's hard to find a faster, sturdier and more reliable ship. Chance Vought Corporation, East Hartford, Connecticut. Division of United Aircraft & Transport Corporation.

SEE THE VOUGHT EXHIBITION SPACE 121-133, AT NATIONAL AIRCRAFT SHOW, DETROIT



CHANCE VOUGHT CORPORATION

WACO
F SERIES
Waco Aircraft Company
Troy, Ohio

Specifications: (Powered with Kinner K-5, 90 horsepower and Warner Scarab 110 horsepower respectively). Span, upper wing, 29 feet 7 inches. Span, lower wing, 27 feet 6 inches. Length overall, 21 feet. Heights overall, 8 feet 4 inches. Wing areas, (including ailerons), 241.5 square feet. Power loadings, 20.8; 17.27 pounds per horsepower. Wing loadings, 7.77; 7.9 pounds per square foot. Weights empty, 1,125; 1,150 pounds. Useful loads, 747, 747 pounds. Gross weights, 1,872; 1,897 pounds.

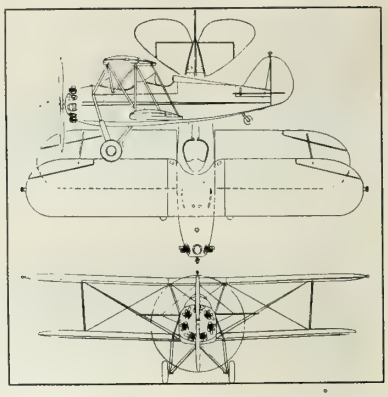


Performance: High speeds, 108; 115 miles per hour. Cruising speeds, 93; 95 miles per hour. Landing speeds, 32, 32 miles per hour. Rates of climb, 700; 800 feet per minute. Service ceilings, 15,000; 16,000 feet. Radii, (Scarab-powered) 400 miles. Gasoline capacities, 32; 32 gallons.

The fuselage is of welded steel tubing, fabric covered. The wings use an N. A. C. A. type M 18 airfoil section. The spars and ribs are of spruce and are fabric covered. The landing gear of the divided type and is equipped with dual controlled brakes, which are operated in conjunction with the rudder. An auxiliary hand arrangement combined with the throttle is provided for setting both brakes; a locking arrangement for parking is provided. Low-pressure tires with brakes, or Bendix wheels and brakes, are standard equipment. A tail wheels is used. Elevators are balanced.

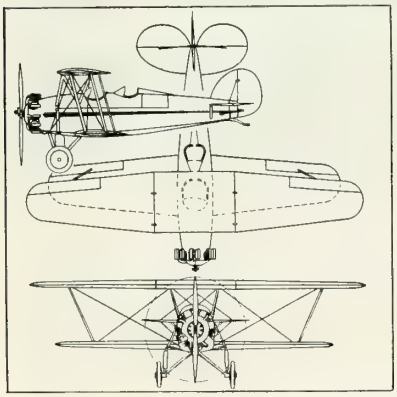
Standard instruments are compass, altimeter, tachometer, oil pressure and temperature gauges. The controls are dual. Model F accommodates three persons.

For additional information see advertisement on page 5 of this issue



WACO
STRAIGHT WING AND TAPER WING
The Waco Aircraft Company
Troy, Ohio

Specifications: (Straight and Taper Wing respectively) Span, upper wings, 30 feet 7 inches; 30 feet 3 inches. Span, lower wings, 27 feet 4 inches; 25 feet, 11 inches. Length overall, 22 feet 6 inches; 22 feet 6 inches. Heights overall, 9 feet; 9 feet. Wing area, 288; 227 square feet. Power loadings, 10.82; 11.5 pounds per horsepower. Wing loadings, 9.03; 11.45 pounds per square foot. Wright J-6-7 240 horsepower. Weights empty, 1,628; 1, 677 pounds. Useful loads 972; 923 pounds. Gross weights, 2,600; 2,600 pounds.



Performance: High speeds, 128; 141 miles per hour. Cruising speeds, 108; 120 miles per hour. Landing speeds, 44; 48 miles per hour. Rates of climb, 1,200; 1,500 feet per minute. Service ceilings, 18,000; 18,000 feet. Radii, 500; 550 miles. Gasoline capacities, 65; 65 gallons.

The fuselage is constructed of welded steel tubing, fabric covered.

Standard instruments are compass, navigation lights, tachometer, altimeter, oil pressure and temperature gauges, gasoline gauge, and air speed indicator. A hard inertia starter is provided. The cockpits are upholstered. Dual controls with throttles on both sides of the cockpit are provided. A baggage compartment with a lock is standard. Doors are provided for easy access to forward cockpit. The landing gear is the split-axle type and is provided with brakes. U. S. Royal tires are used. Plane is equipped with pneumatic tail wheel. The propeller is Hartzell, wood. The 225 accommodates three persons.

For additional information see advertisement on page 5 of this issue



ZENITH
Z-6-B
Zenith Aircraft Corporation
Midway City, California

Specifications: Span, upper wing, 41 feet 6 inches; lower wing, 38 feet. Length overall, 30 feet 10.37 inches. Height overall, 10 feet 10.25 inches. Wing area (including ailerons), 429.9 square feet. Power loading, 11.33 pounds per horsepower. Wing loading, 11.06 pounds per square foot. Pratt & Whitney 420 horsepower. Weight empty, 2,845 pounds; Useful load, 1,918 pounds; Gross weight, 4,763 pounds.



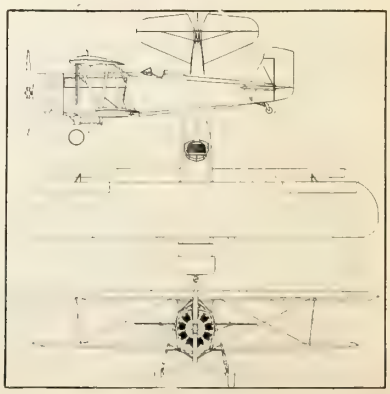
Performance: High speed, 150 miles per hour. Cruising speed, 125 miles per hour. Stalling speed, 58 miles per hour. Rate of climb, 1,130 feet per minute. Climb in 10 minutes, 7,410 feet. Service ceiling, 19,100 feet. Radius, 5 hours. Gasoline capacity, 98 gallons.

The fuselage is of welded steel tubing, fabric covered. The framework of the ailerons and tail surfaces is all-metal construction, covered with fabric. The wings are constructed of spruce box spars and spruce ribs. Covering is of fabric.

Inset ailerons are provided on both upper and lower panels.

The landing gear is of steel tubing, heat treated. The propeller is Hamilton-Standard. Shock absorbers are Gruss Air Struts. The Zenith Z-6-B is equipped with Goodrich tires, Eclipse electric starter, Aircraft Products or Bendix brakes, and Pioneer instruments for day or night flying. Other accessories included are a generator, storage battery and N. A. C. A. cowling.

The Zenith Z-6-B accommodates seven persons and has baggage accommodations for 80 pounds. The seating arrangement provides for six places in the passengers' cabin and a single-place cockpit for the pilot.



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that prevents sweating and fogging and keeps air currents away from the eyes.

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which prevent wind seepage and slipping, yet place no pressure on the head.

4. Duralumin Frames
for increased lightness and strength.

5. Micro Adjustable Bridge
for perfect fitting.

6. Wide Angle Vision
Optically precise, the new, deep curved lenses bring you a lateral vision range of 1350 with no distortion.

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REGULAR No. 6	9.75	26.00
U. S. AIR SERVICE No. 6	10.75	28.00
U. S. AIR SERVICE No. 7	13.75	30.00
LUXOR No. 8	18.00	32.00

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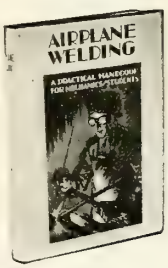
By Alexander Klemin

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By J. B. Johnston, M.E.



Between the covers of this timely book is packed every fact and every bit of information available today on the art of welding in aircraft design, construction and repair. It covers every method of welding—every type of weld—every weldable metal—in plain, everyday language. The author has trained many men in the art of aircraft welding, and is considered everywhere a real authority on the subject. The book is unusually easy to read and understand. .Flexible binding, 320 pages, 210 illustrations. Price, $3.50.

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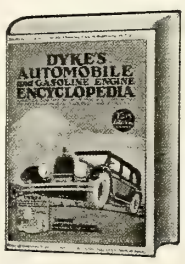
By Capt. R. Duncan

Here is the book that contains the exact information needed by a flyer to become an efficient air navigator. A book for every flyer and every man who is itching to get into the air. The author has flown over 4,000 hours and is a licensed pilot in United States, England, France and Canada. Covers use of airplane compass. air speed indicator, altimeter, course and drift indicator and all other instruments, maps, night-flying, weather forecasting, calculating magnetic variations and other problems of air navigation. Pocket size. Flexible binding, 243 pages, 70 illustrations. Price, $3.00.



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The Burnelli Transport

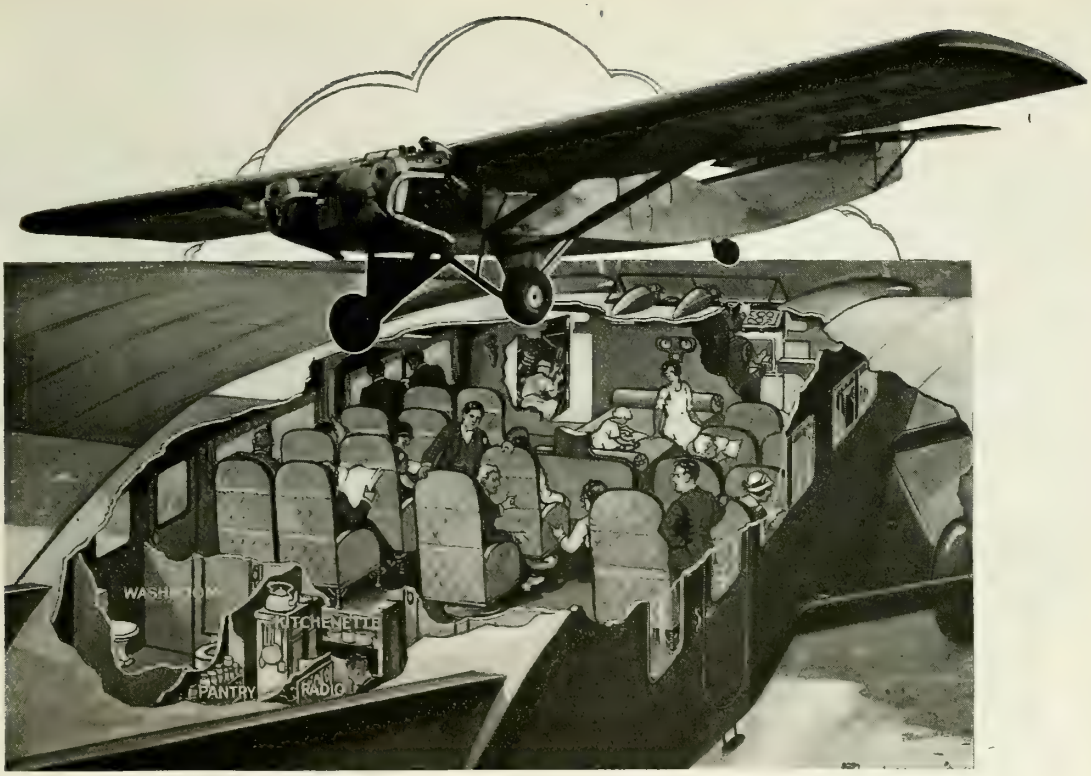


All Metal Construction . . . .

THE *Burnelli Transport* is designed around basic patents covering all-wing airplane design. Its departure in multiple-engine design evolves from the plan of merging the three units of the conventional nacelle type into a single frontal area of airfoil contour whose width is sufficient to mount engines and propellers at the entering edge. This is the ideal aerodynamic all-wing theory with the practical requirements for passenger cargo accommodation, engine installation and structural suitability ● The duplex power plant is accessible for inspection and minor repairs, with each power unit entirely independent of the other. Each is capable of maintaining single-engined flight with full load ● All metal construction of a new type is used throughout, through which is obtained greater structural simplicity and durability.

All Standard Burnelli Transports Are Convertible to Seaplane Types

BURNELLI TYPE AIRCRAFT



Safety, Performance, Economy

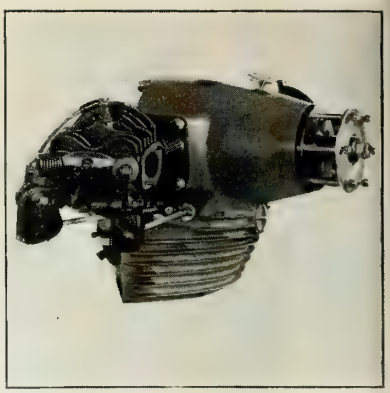
THE unusually wide cabin of the *Burnelli Transport* provides the maximum passenger accommodations and cargo space. The cabin of the twenty-passenger type measures twelve feet wide, seventeen feet long and five feet six inches high—containing 1,122 cubic feet of space, not including the mail compartment. This is seventy-five per cent greater than in ordinary passenger planes of similar horsepower. The total designed payload is slightly more than twenty-five per cent of the gross weight and yields a distributed load of 4.1 pounds per cubic foot of cabin space ● This generous cabin area contributes to the increased comfort and convenience required in modern air transportation, providing large reclining chairs, lounge or berths for night flying and ample room for lavatory, radio, galley, baggage and mail.

Performance, Cost and Delivery Data of Various Types Furnished on Request

UPPERCU - BURNELLI CORP.

KEYPORT, NEW JERSEY

AERONCA
E-113 AND E-107
Aeronautical Corporation of America
Cincinnati, Ohio

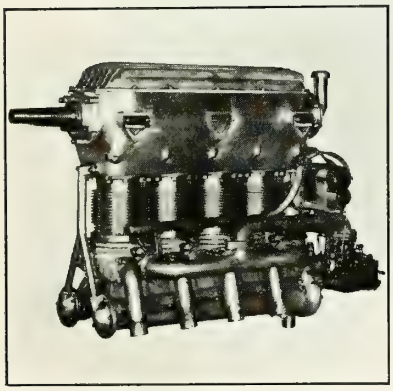


Specifications (E-113): Length (less starter), 24 inches. Height overall, 18 inches. Width overall, 32¼ inches. Bore, 4¼ inches. Stroke, 4 inches. Displacement, 113 cubic inches. Weight dry (less hub and starter), 110 pounds. Fuel consumption, .65 pounds per horsepower per hour. Oil consumption, .02 pounds per horsepower per hour. The mounting is three bolt. Upper bolt is 3⅞ inches above thrust line; two lower bolts, 9¾ inches below thrust line and 5¼ inches on either side of the vertical center line.

The Aeronca E-113 is a two-cylinder four-cycle air-cooled opposed aircraft powerplant developing 35 horsepower at 2,400 revolutions per minute. Compression ratio is 5.1. A single Bosch magneto and a Windfield carburetor are provided. The lubrication system is force feed to crankshaft, dry sump. There are two valves per cylinder, one intake and one exhaust. Propeller drive is direct. The pistons are of the trunk type, Permite, made by Aluminum Industries, Inc. There are three compression rings per cylinder, one oil-regulating Perfect Circle. The cylinder heads are the L-head type, constructed of alloy. The cylinder barrels are turned steel. The E-107-A, specifications for which vary slightly, develops 26 horsepower at 2,500 revolutions per minute, weight, 111 pounds.

For additional information see advertisement on page 71 of this issue

CHEVOLAIR
D-4
Chevolair Motors, Inc.
Indianapolis, Indiana



Specifications: Length overall (less starter), 44⅜ inches. Height overall, 31¾ inches.

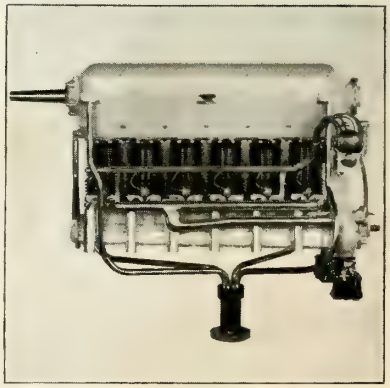
Bore, 4⅝ inches. Stroke, 5¼ inches. Displacement, 352 cubic inches. Weight dry (less hub and starter), 345 pounds. Fuel consumption, .56 pounds per horsepower per hour. Oil consumption, .03 pounds per horsepower per hour.

The Chevolair D-4 is a four-cylinder four-cycle air-cooled inverted in-line aircraft powerplant developing 90 horsepower at 2,000 revolutions per minute. Compression ratio is 5.5. Dual Bosch magnetos are standard equipment. Dual Stromberg carburetors are provided. The lubrication system is of the pressure type. There are four valves per cylinder, two intake valves and two exhaust valves, Jadson. The propeller drive is direct. All standard makes of starters are provided for in the construction of this engine.

The pistons are of the flat-head type, constructed of aluminum alloy. There are five piston rings per piston, product of the Perfect Circle company. The cylinder heads are spherical, Bohanalite, made by Bohn Aluminum and Brass Corporation. The cylinder barrels are drop forged, product of the Canton Drop Forging Company. The crankcase is of the semi-barrel type, constructed of magnesium.

Special accessories include a fuel pump which is optional.

CHEVOLAIR
D-6
Chevolair Motors, Inc.
Indianapolis, Indiana



Specifications: Length overall (less starter), 58¾ inches. Height overall, 31¼ inches.

Bore, 4⅝ inches. Stroke, 5¼ inches. Displacement, 529 cubic inches. Weight dry (less hub and starter), 425 pounds. Fuel consumption, .57 pounds per horsepower per hour. Oil consumption, .03 pounds per horsepower per hour.

The Chevolair D-6 is a six-cylinder four-cycle air-cooled inverted in-line aircraft powerplant developing 165 horsepower at 2,175 revolutions per minute. Compression ratio is 5.5. Dual Bosch magnetos are standard equipment. Dual Stromberg carburetors are standard equipment. The lubrication system is of the pressure type. There are four valves per cylinder, two intake valves and two exhaust valves, Jadson. The propeller drive is direct. All standard makes of starters are provided for in the construction of this powerplant.

The pistons are of the flat-head type. There are five piston rings per piston, made by the Perfect Circle company. The cylinder heads are spherical, Bohnalite, made by the Bohn Aluminum and Brass Corporation. The cylinder barrels are drop forged, product of the Canton Drop Forge Company. The crankcase is of the semi-barrel type, constructed of magnesium.

Special accessories include a fuel pump which is optional.

All accessories on the D-6 are mounted to the rear.

CIRRUS
INVERTED
A. C. E. Corporation
Marysville, Michigan



Specifications: Length overall, 38½ inches. Height overall, 36⅜ inches. Width overall, 19¾ inches. Bore, 4⅜ inches. Stroke, 5⅛ inches. Displacement, 310 cubic inches. Weight dry, 270 pounds. Fuel consumption, .54 pounds per brake horsepower per hour. Oil consumption, .010 pounds per brake horsepower per hour.

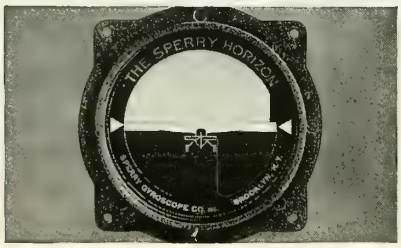
The American Cirrus aircraft powerplant is a four-cylinder air-cooled in-line engine. With high compression ratio of 5.4 it develops 91 brake horsepower at 1,900 revolutions per minute and 96 brake horsepower at 2,100 revolutions per minute. With low compression ratio of 5.1 it develops 87 brake horsepower at 1,900 revolutions per minute and 91 brake horsepower at 2,100 revolutions per minute. Dual Scintilla PN-4 magnetos and Stromberg carburetor, Type NA-R3, are standard equipment. The lubrication system is of the forced feed type. Oil from the reservoir in the lower crankcase is forced by a gear-type pump to the crankshaft bearings and then through drillings in the crankshaft to the connecting rod bearings.

Engines are shipped with high or low type mounting feet. A starter mounting flange, S.A.E. with splined crankshaft end is provided. Tachometer is single drive ½ crankshaft speed with S.A.E. or Air Corps fitting, rotation clockwise. Equipment includes tool kit.

For additional information see advertisement on page 139 of this issue



AGAIN



"PRECISION"

CONTRIBUTES TOWARD SAFE FLYING!

Darkness, clouds, fogs, storms—to master them has been one of aviation's big problems. For "blind flying", with all landmarks hidden, is often necessary if flying schedules are to be maintained.

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In the "Sperry Horizon" (the latest of the many important contributions made by the Sperry Gyroscope Co. Inc. of Brooklyn, N. Y.) six NORMA-HOFFMANN Precision Bearings are used.

Two of them, on the rotor shaft of the gyro, operate up to 14,000 R. P. M.—speedability is the essential, here. The other four, in the gimbal mounting, make only a fraction of a revolution—here friction-free delicacy is demanded. PRECISION satisfies both requirements.

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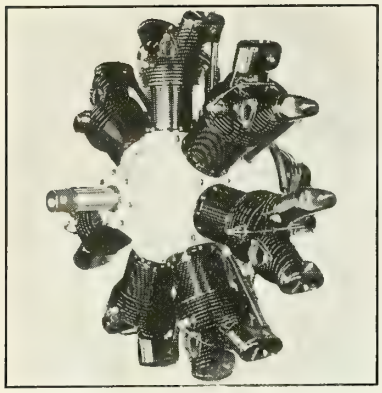
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BALL, ROLLER AND THRUST

NORMA-HOFFMANN BEARINGS CORPORATION STAMFORD, CONN., U.S.A.



CONTINENTAL
A70
Continental Aircraft Engine Company
Detroit, Michigan

Specifications: Length overall (less starter), 32-5/8 inches. Diameter overall, 42¾ inches. Mounting bolt diameter, 20 inches. Bore, 4⅝ inches. Stroke, 4⅝ inches. Displacement, 544 cubic inches. Fuel consumption, .55 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower hour.

The Continental A70 is a seven-cylinder four-cycle air-cooled static radial aircraft power plant developing 165 horsepower at 2,000 revolutions per minute. Compression ratio is 5.4. Dual Scintilla magnetos are provided. Carburetor is Stromberg NAR-5. In the lubrication system the feed pump withdraws oil from separate tank and delivers to bearings. Excess oil is pumped from the crankcase and returned to the tank by a scavenger pump. There are two valves per cylinder; one intake valve of Tungsten steel, one exhaust valve of C.N.S. steel. The propeller drive is direct with an S.A.E. 20 spline shaft. Inertia, electric or air starter with S.A.E. mounting is provided for. The Bohn pistons are of the trunk type, aluminum alloy. There are four piston rings per piston. The cylinder heads are Bohn, of aluminum alloy, screwed and shrunk to barrel. The cylinder barrels are of pierced steel forging with fins machined integral. The crankcase is split on cylinder centerline, of aluminum alloy, product of Bohn Aluminum & Brass Company.

For additional information see advertisement on page 4 of this issue

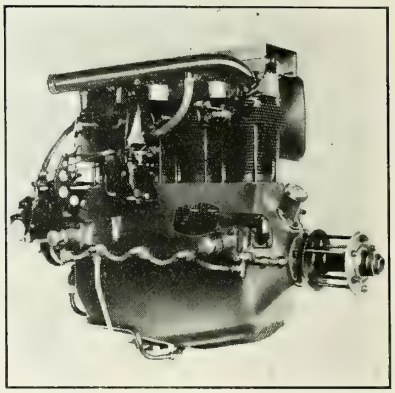
CURTISS-WRIGHT
GIPSY L-320
Wright Aeronautical Corporation
Paterson, New Jersey

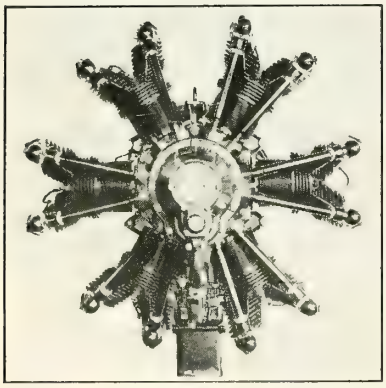
Specifications: Length overall (without accessories), 43-7/32 inches. Height overall (without accessories), 34-3/16 inches. Width overall (without accessories), 20-3/32 inches. Mounting bolt diameter (distance between mounting bolts), 17-11/16 inches. Bore, 4½ inches. Stroke, 5 inches. Displacement, 318 cubic inches. Weight dry (less hub and starter), 285 pounds. Fuel consumption, .55 pounds per brake horsepower per hour. Oil consumption, .010 pounds per brake horsepower per hour.

This engine is a four-cylinder four-cycle air-cooled in-line powerplant developing 90 horsepower at 1,950 revolutions per minute. Compression ratio is 5. Dual Scintilla PN-4-DF magnetos and one Stromberg NA-R3A carburetor are provided. The lubrication system is wet sump, full pressure. There are two valves per cylinder, one intake valve and one exhaust valve. Propeller drive is direct. Starter provided for is Eclipse geared hand starter.

The pistons are of the slipper type, aluminum, Wright made. There are two compression and one oil scraper ring per piston, U. S. or American Hammered. The cylinder heads are aluminum, Wright made. The cylinder barrels are nickel cast iron, Wright made. The crankcase is aluminum, made by Wright.

Standard equipment includes one set of magneto and carburetor controls, complete cowl, tachometer drive, tool kit, 8 A.C. spark plugs, one set of ignition cable.





CURTISS-WRIGHT
CHALLENGER R-600
Wright Aeronautical Corporation
Paterson, New Jersey

Specifications: Length overall (without accessories), 42⅝ inches. Height (without accessories), 48-1/16 inches. Width (without accessories), 41¾ inches. Mounting bolt diameter, 18 inches. Bore, 5⅛ inches. Stroke, 4⅞ inches. Displacement, 603 cubic inches. Weight dry (less hub and starter), 440-450 pounds. Fuel consumption, .55 pounds per brake horsepower per hour. Oil consumption, .025 pounds per brake horsepower per hour.

The Curtiss-Wright Challenger R-600 is a six-cylinder four-cycle air-cooled static radial aircraft powerplant developing 185 horsepower at 2,000 revolutions per minute. Compression ratio is 5.2. Dual Scintilla MN6-DF-3 magnetos and one Stromberg NAU4J carburetor are provided. The lubrication system is dry sump, full pressure. There are two valves per cylinder, one intake and one exhaust. Propeller drive is direct. Starter provided for is Eclipse hand inertia (Series 6 or 16) or Eclipse electric. Pistons are cast aluminum, produced by Wright. There are four piston rings (two Simplex) per piston. Cylinder heads are cast aluminum, Wright-manufactured. Cylinder barrels are forged steel, produced by the Wright company. The crankcase is cast aluminum, produced by Wright.

Standard equipment includes Air-Maze air cleaner, tool kit, 12 B.G. IXA spark plugs, single tachometer drive, carburetor heater and connections, primer pump and additional piping.

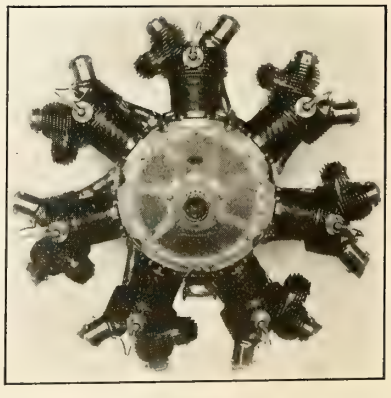
CURTISS-WRIGHT
WHIRLWIND 240 R-760-E
Wright Aeronautical Corporation
Paterson, New Jersey

Specifications: Length overall (less starter), 40⅝ inches. Height overall, 47 inches. Diameter overall, 45 inches. Mounting bolt diameter, 19¼ inches. Bore, 5 inches Stroke, 5.5 inches. Displacement, 756 cubic inches. Fuel consumption, .55 pounds per brake horsepower per hour. Oil consumption, .035 pounds per horsepower per hour.

The Curtiss-Wright Whirlwind 300 R-760-E is a seven-cylinder four-cycle air-cooled radial aircraft powerplant developing 240 horsepower at 2,000 revolutions per minute. Compression ratio is 5.1. Dual Scintilla MN7DF magnetos and one Stromberg NA-R7 carburetor are provided. The lubrication system is dry sump, full pressure. There are two valves per cylinder, one intake and one exhaust, Thompson or Rich. Propeller drive is direct. Starter provided for is Eclipse hand inertia or hand inertia and electric.

The pistons are aluminum, made by Wright. There are four compression rings per cylinder, U. S. Hammered or American Hammered. The cylinder heads are aluminum, produced by Wright. The cylinder barrels are chrome-nickel steel, made by Wright. The crankcase is aluminum, Wright produced.

Standard equipment includes all cover plates ignition switch, carburetor air heater and cleaner, nose cowl, tool kit, oil filter, 14 B.G. spark plugs, front exhaust manifold and connections, priming pump and connections.



TWO MORE RECORDS

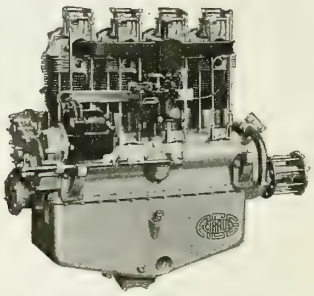
CIRRUS

CIRRUS ACE

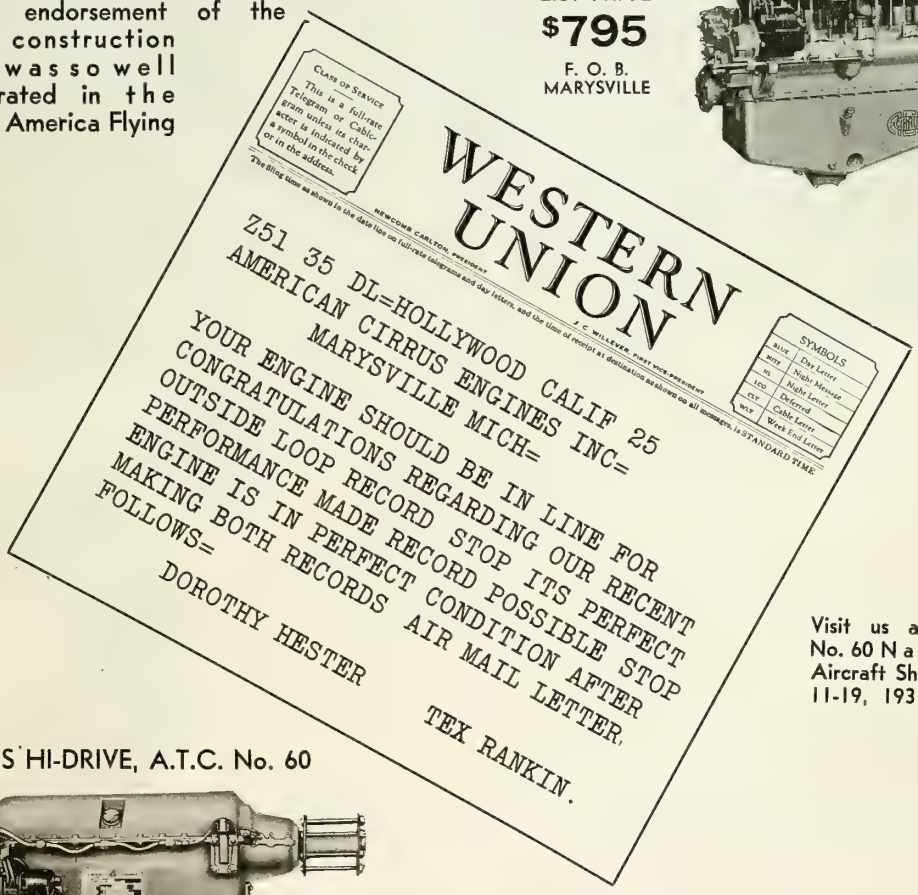
SIMPLICITY RELIABILITY ECONOMY

THE RUGGED DEPENDABILITY of this world famous engine makes possible two more records in which engine performance is of paramount importance. Another endorsement of the sound construction which was so well demonstrated in the 1930 All America Flying Derby.

CIRRUS UPRIGHT, 90 H.P., A.T.C. NO. 30



NEW
LIST PRICE
$795
F. O. B.
MARYSVILLE



WESTERN UNION

NEWCOMB CARLTON, PRESIDENT — J. C. WILLEVER, FIRST VICE-PRESIDENT

CLASS OF SERVICE: This is a full-rate Telegram or Cable-gram unless its character is indicated by a symbol in the check or in the address.

The filing time as shown in the date line on full-rate telegrams and day letters, and the time of receipt at destination as shown on all messages, is STANDARD TIME.

SYMBOLS: BLUE Day Letter; NL Night Message; NLT Night Letter; DLT Deferred; WLT Cable Letter; Week End Letter

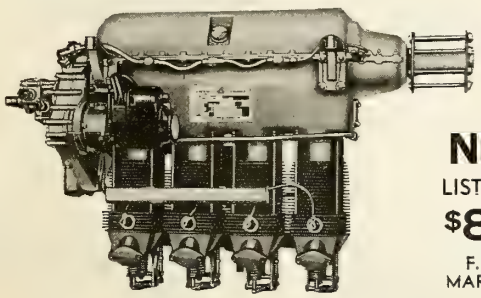
Z51 35 DL=HOLLYWOOD CALIF 25
AMERICAN CIRRUS ENGINES INC=
MARYSVILLE MICH=
YOUR ENGINE SHOULD BE IN LINE FOR
CONGRATULATIONS REGARDING OUR RECENT
OUTSIDE LOOP RECORD STOP ITS PERFECT
PERFORMANCE MADE RECORD POSSIBLE STOP
ENGINE IS IN PERFECT CONDITION AFTER
MAKING BOTH RECORDS AIR MAIL LETTER
FOLLOWS=

DOROTHY HESTER

TEX RANKIN.

Visit us at Booth No. 60 National Aircraft Show April 11-19, 1931.

CIRRUS HI-DRIVE, A.T.C. No. 60



NEW
LIST PRICE
$895
F. O. B.
MARYSVILLE

THE production of this record breaking line of aircraft engines will be continued in the same well equipped factory with the same well trained factory personnel by the new owners.

A. C. E. CORPORATION

MARYSVILLE, MICHIGAN

CURTISS-WRIGHT
WHIRLWIND 300 R-975-E
Wright Aeronautical Corporation
Paterson, New Jersey

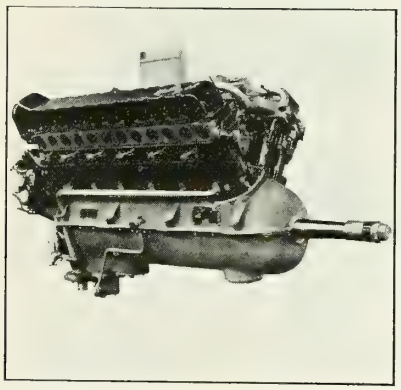


Specifications: Length overall (with standard equipment), 41-7/16 inches. Height overall, 47 inches. Width overall, 45 inches. Mounting bolt diameter, 19¼ inches. Bore, 5 inches. Stroke, 5½ inches. Displacement, 973 cubic inches. Weight dry (less hub and starter), 575 pounds, approximately. Fuel consumption, .55 pounds per brake horsepower per hour. Oil consumption, .035 pounds per brake horsepower per hour.

The Curtiss-Wright Whirlwind 300 R-975E is a nine-cylinder four-cycle air-cooled radial aircraft powerplant developing 300 horsepower at 2,000 revolutions per minute. Compression ratio is 5.1. Dual Scintilla VAG-9D magnetos and one Stromberg NA-R9 carburetor are provided. The lubrication system is dry sump, full pressure. There are two valves per cylinder, one intake and one exhaust, Thompson or Rich. Propeller drive is direct. Starter provided for is Eclipse hand inertia or hand and inertia.

The pistons are of the trunk type, of cast aluminum alloy, made by Wright. There are four compression rings per cylinder, of U. S. Hammered or American Hammered manufacture. The cylinder heads are cast aluminum alloy, Wright produced. The cylinder barrels are forged chrome-nickel steel, made by Wright. The crankcase is cast aluminum alloy, made by Wright.

For additional information see advertisement on page 143 of this issue



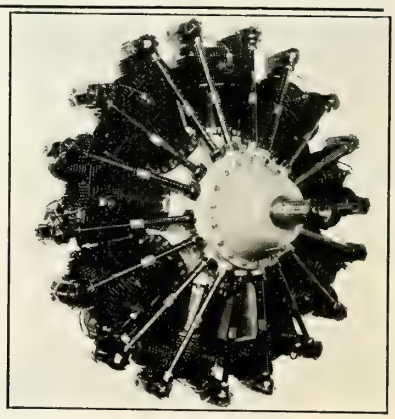
CURTISS-WRIGHT
D-12 V-1150-E
Wright Aeronautical Corporation
Paterson, New Jersey

Specifications: Length overall (less starter), 56¾ inches. Height overall, 34¾ inches. Mounting bolt centers, 15¾ inches (distance between mounting bolt rows). Bore, 4½ inches. Stroke, 6 inches. Displacement, 1,145 cubic inches. Weight dry (less hub and starter), 685 pounds approximately. Fuel consumption, .53 pounds per brake horsepower per hour. Oil consumption, .020 pounds per brake horsepower per hour.

The Curtiss-Wright D-12 is a twelve-cylinder four-cycle water-cooled Vee-type aircraft powerplant developing 435 horsepower 2,300 revolutions per minute. Compression ratio is 5.3. Dual Scintilla V-AG 12 D magnetos are provided. Dual Stromberg NA-Y5-F carburetors are furnished. There are four valves per cylinder, two intake and two exhaust. Propeller drive is direct. Starter is Eclipse hand inertia or hand and electric inertia. Pistons are of the trunk type, cast aluminum, product of the Wright Aeronautical Corporation. There are three piston rings per piston. The cylinder heads are of the block type, cast aluminum, product of the Wright Aeronautical Corporation. Cylinder barrels are of the sleeve type forged steel, product of the Wright corporation. The crankcase is of the split type, cast aluminum, product of the Wright corporation.

Standard equipment includes internal oil screens, ignition switch, tachometer drive, and 24 B. G. 4B spark plugs.

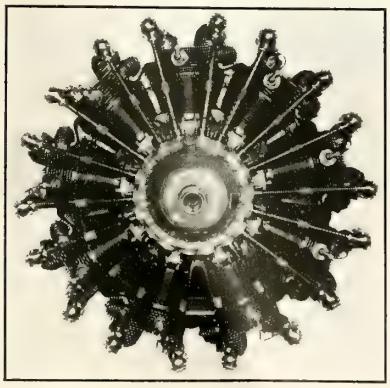
CURTISS-WRIGHT
CYCLONE R-1750-E
Wright Aeronautical Corporation
Paterson, New Jersey



Specifications: Length overall (without accessories), 43-27/32 inches. Height overall (without accessories), 54-11/16 inches. Width overall (without accessories), 54-11/16 inches. Mounting bolt diameter, 23⅜ inches. Bore, 6 inches. Stroke, 6-33/¬0 inches. Displacement, 1,750 cubic inches. Weight dry (less hub and starter), 825-840 pounds. Fuel consumption, .55 pounds per brake horsepower per hour. Oil consumption, .035 pounds per brake horsepower per hour.

The Curtiss-Wright Cyclone R-1750-E is a nine-cylinder four-cycle air-cooled static radial-type aircraft powerplant developing 525 horsepower at 1,900 revolutions per minute. Compression ratio is 5.1. Dual Scintilla VAG-9D magnetos and one Stromberg NAY-7B carburetor are provided. The lubrication system is dry sump, full pressure. There are two valves per cylinder, one intake valve and one exhaust valve, produced by Thompson or Rich. Propeller drive is direct. Starter provided for is Eclipse hand inertia or hand and electric inertia.

The pistons are cast aluminum, produced by Wright. There are four compression and two oil scraper rings per piston, made by U. S. Hammered or American Hammered. The cylinder heads are cast of aluminum, produced by Wright. The cylinder barrels are forged chrome-nickel steel, made by Wright. The crankcase which is made of cast aluminum, is produced by Wright.



CURTISS-WRIGHT
CYCLONE R-1820-E
Wright Aeronautical Corporation
Paterson, New Jersey

Specifications: Length overall (without accessories), 43-27/32 inches. Height overall (without accessories), 54-11/16 inches. Width overall (without accessories), 54-11/16 inches. Mounting bolt diameter, 23⅜ inches. Bore, 6⅛ inches. Stroke, 6⅞ inches. Displacement, 1,823 cubic feet. Weight dry (less hub and starter), 835-850 pounds. Fuel consumption, .55 pounds per brake horsepower per hour. Oil consumption, .035 pounds per brake horsepower per hour.

The Curtiss-Wright Cyclone R-1820-E is a nine-cylinder four-cycle air-cooled static radial-type aircraft powerplant developing 575 horsepower at 1,900 revolutions per minute. Compression ratio is 5.1. Dual Scintilla VAG-9D magnetos and one Stromberg NAY-8A carburetor are provided. The lubrication system is dry sump, full pressure. There are two valves per cylinder, one intake valve and one exhaust valve, Thompson or Rich manufacture. Propeller drive is direct. Starter provided for is Eclipse hand inertia or hand and electric inertia starter.

The pistons are of the trunk type, cast aluminum, Wright-manufactured. There are four compression and two oil scraper rings per piston, produced by U. S. Hammered or American Hammered. The cylinder heads are cast aluminum, produced by Wright. The cylinder barrels are forged chrome-nickel steel, made by Wright. The crankcase is cast aluminum, made by Wright.

FAMOUS FLIGHTS WITH THOMPSON VALVES

Again with . .
COL. LINDBERGH
• IN A •
RECORD-BREAKING FLIGHT

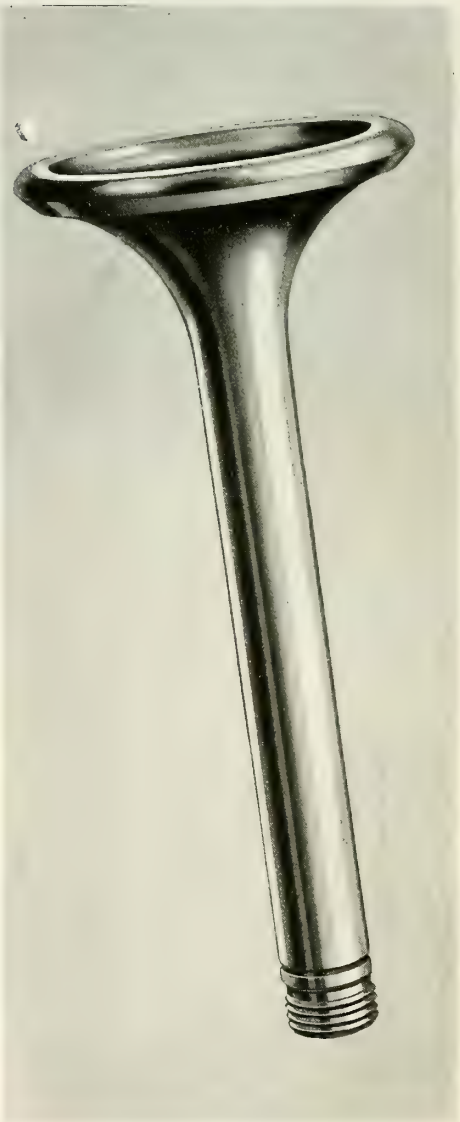
On April 20, 1930, another world's record was added to the aerial conquests of Colonel Charles A. Lindbergh. With Mrs. Lindbergh as co-pilot, the "Flying Colonel" took off from Los Angeles at dawn in a Lockheed-Sirius monoplane and landed 14 hours and 45 minutes later at Roosevelt Field, Long Island.

The primary object of this flight was to test the practicability of higher altitudes for commercial flying. But in accomplishing this, Col. Lindbergh also broke all previous coast-to-coast speed records . . . averaging better than 175 miles per hour.

In this flight, as in his famous trans-Atlantic flight, Col. Lindbergh relied on Thompson Valves. The 18 Thompson Valves in the Pratt & Whitney "Hornet" engine of his Lockheed-Sirius monoplane afforded the typical dependability that has given these valves world-leadership.

Utter reliability in practically all American record flights, as well as in the most grueling block tests, has influenced the adoption of Thompson Valves for today's finest airplane motors.

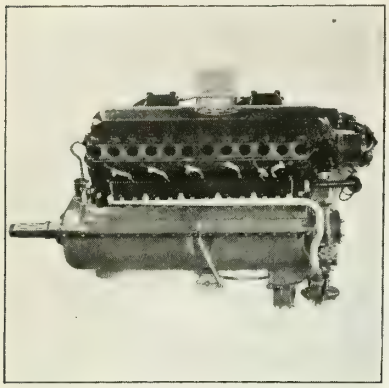
THOMPSON PRODUCTS, INCORPORATED
General Offices: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT





Thompson Valves

(This advertisement is one of a series recalling historic airplane flights in which Thompson Valves were used.)



CURTISS-WRIGHT
CONQUEROR V-1570-C
Wright Aeronautical Corporation
Paterson, New Jersey

Specifications: Length overall (less starter), 64 inches. Height overall, 39-1/16 inches. Mounting bolt centers (distance between mounting bolt rows), 15¾ inches. Bore, 5⅛ inches. Stroke, 6¼ inches. Displacement, 1,569 cubic inches. Weight dry (less hub and starter), 835 pounds approximately. Fuel consumption, .53 pounds per brake horsepower per hour. Oil consumption, .020 pounds per brake horsepower per hour.

The Curtiss-Wright Conqueror is a twelve-cylinder four-cycle liquid-cooled Vee-type aircraft powerplant developing 600 horsepower at 2,400 revolutions per minute. Compression ratio is 6.1. One Scintilla SC double magneto is provided. Dual Stromberg NA-Y60 carburetors are provided. The lubrication system is pressure and scavenging. There are four valves per cylinder, two intake and two exhaust. Propeller drive is direct. Starter provided for is Eclipse and inertia or hand and electric inertia. Pistons are of the trunk type, cast aluminum, product of the Wright Aeronautical Corporation. There are four piston rings per cylinder. The cylinder heads are of the block type, cast aluminum, product of the Wright corporation. The cylinder barrels are of the sleeve type, forged steel, product of Wright. The crankcase is of the split type, cast aluminum, made by Wright.

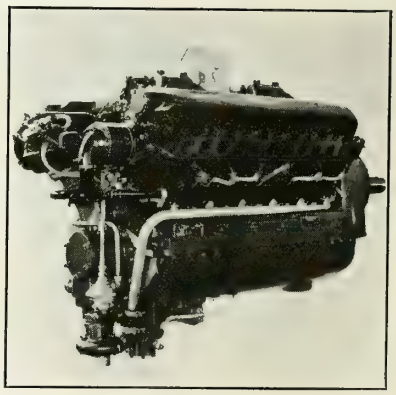
Standard equipment includes radio shielded ignition wires and cable tubes, 24 spark plugs B.G. 4-B-1, generator, etc.

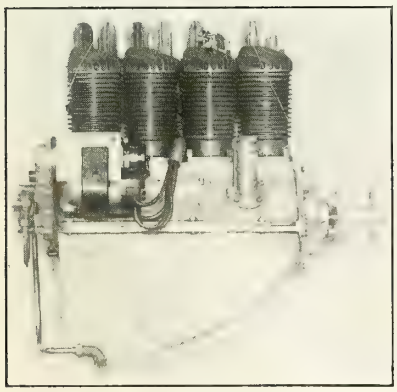
CURTISS-WRIGHT
CONQUEROR GV-1570-C
Wright Aeronautical Corporation
Paterson, New Jersey

Specifications: Length overall (less starter), 68-27/32 inches. Height overall, 39-1/16 inches. Mounting bolt centers (distance between mounting bolt rows), 15¾ inches. Bore, 5⅛ inches. Stroke, 6¼ inches. Displacement, 1,569 cubic inches. Weight dry (less hub and starter), 925 pounds approximately. Fuel consumption, .53 pounds per brake horsepower per hour. Oil consumption, .020 pounds per brake horsepower per hour.

The Curtiss-Wright Conqueror GV-1570-C has a propeller drive geared 2:1 or 7:5. It is a twelve-cylinder four-cycle liquid-cooled Vee-type geared aircraft powerplant developing 600 horsepower at 2,450 revolutions per minute. Compression ratio is 6.1. One Scintilla SC double magneto and two Stromberg NA-Y60 carburetors are provided. The lubrication system is pressure and scavenging. There are four valves per cylinder, two intake and two exhaust. Starter provided for is Eclipse hand inertia or hand and electric inertia. The pistons are of the trunk type, cast aluminum, produced by Wright. There are four piston rings per piston. The cylinder heads are of the block type, cast aluminum, produced by Wright. The cylinder barrels are of the sleeve type forged steel, product of Wright. The crankcase is of the split type, cast aluminum, product of Wright.

Standard equipment includes Cuno oil strainer, water pump and piping, priming tubes and fitting, 24 B.G. spark plugs 4-B-1.





HEATH
B-4
Heath Aircraft Corporation
Chicago, Illinois

Specifications: Length overall (less starter), 25 inches. Height overall, 24 inches. Bore, 2¾ inches. Stroke, 3½ inches. Displacement, 83 cubic inches. Weight dry (less hub and starter), 119 pounds. Fuel consumption, 5.5 pounds per horsepower per hour. Oil consumption, .0185 pounds per horsepower per hour.

The Heath B-4 is a four-cylinder four-cycle air-cooled vertical in-line aircraft powerplant developing 27 horsepower at 2,700 revolutions per minute. Compression ratio is 4.5. Bosch single or dual magneto is standard equipment. The carburetor is Zenith. The lubrication system is pressure feed, employing gear pump. There are two valves per cylinder, one intake valve and one exhaust valve, silichrome, made by the Thompson company. The propeller drive is direct.

The pistons are aluminum alloy, made by the Bohn Aluminum and Brass Corporation. There are three piston rings per piston. The cylinder heads are cast iron, integral with the barrel. The cylinder barrels are cast iron, made by the Heath Aircraft Corporation. The crankcase is of the deep sump type, constructed of aluminum alloy, product of the Heath company.

Equipment includes standard S.A.E. tachometer drive, cylinder air scoop, tool kit. Propeller, soft or hard wood or metal, is provided at extra cost.

Spark plugs are provided, one for each cylinder.

JACOBS
LA-1
Jacob Aircraft Engine Company
Camden, New Jersey

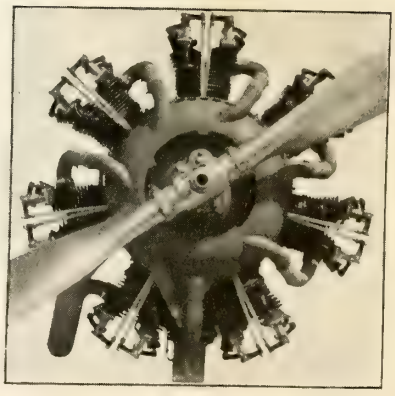
Specifications: Length overall (less starter), 32-9/64 inches. Diameter overall, 44 inches. Mounting bolt diameter, 14¾ inches. Bore, 4½ inches. Stroke, 4¾ inches. Displacement, 528 cubic inches. Weight dry (less hub and starter), 390 pounds. Fuel consumption, .525 pounds per horsepower per hour. Oil consumption, .017 pounds per horsepower per hour.

The Jacobs LA-1 is a seven-cylinder four-cycle air-cooled radial aircraft powerplant developing 150 horsepower at 2,000 revolutions per minute. Compression ratio is 4.8. Dual Scintilla magnetos are standard equipment. Carburetor is Stromberg. The lubrication system employs pressure and scavenger gear pumps. There are two valves per cylinder, one exhaust valve and one intake valve, made by the Thompson company. Propeller drive is direct. Heywood starter is provided for.

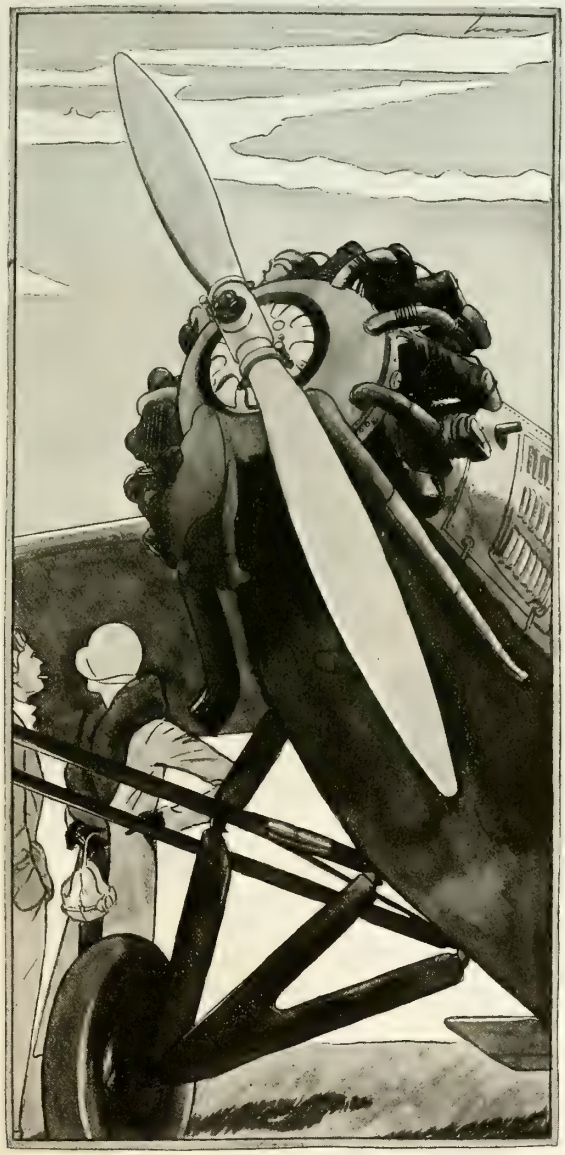
The pistons are of the trunk type, aluminum alloy, made by the Aluminum Company of America. There are four piston rings per piston, U. S. Hammered Piston Ring Company. The cylinder heads are bolted on aluminum alloy, made by the Jacobs Aircraft Engine Company. The cylinder barrels are high-carbon steel, made by Jacobs. The crankcase is one-piece aluminum alloy, made by Jacobs.

Propeller recommended is Hamilton-Standard.

For additional information see advertisement on pages 22-25 of this issue



WRIGHT ENGINES BRING MORE POWER TO 1931 PLANES!



IN rigorous service flights during the past two years, Wright has operated "Whirlwind 300's" under conditions that require from thirty to fifty per cent overload!

The "Whirlwind 300" in the Travel Air "Mystery" ship which swept the races at Cleveland and won the world's record for commercial planes, has given continuous and efficient service while delivering over 400 horsepower!

The "Whirlwind" that hurled Frank Hawks' "Texaco 13" across America at 215 m.p.h. and repeatedly at over 250 m.h.p. has performed most satisfactorily while turning out 400 horsepower and more!

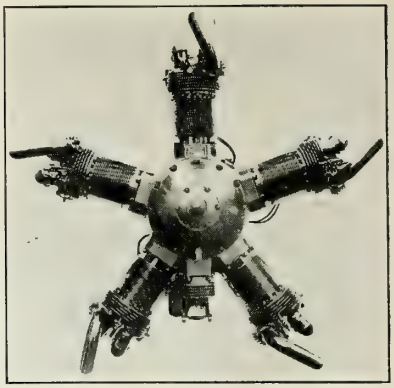
That's the kind of performance you get when you fly behind an engine by Wright. Pilots know it by experience. Owners and operators know it by service checks. Passengers know it by smooth, dependable travel.

For the striking improvements that made these flights possible, as well as those in the new "Cyclone 575," choice of Colonel Lindbergh and Lieutenant Al Williams, are constantly being incorporated into regular production Wright engines!

To build one engine that leads one class is one thing. To build engines that fit every flying need, and to keep each engine far in front is another thing. Yet that's what Wright has done for years, and what these constant developments do again for Wright owners of 1931!

WRIGHT
AERONAUTICAL CORPORATION
PATERSON, NEW JERSEY
A DIVISION OF CURTISS-WRIGHT CORPORATION

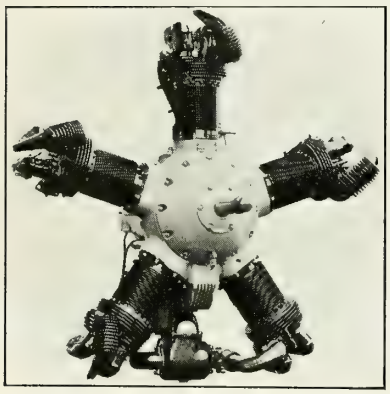
KINNER
K-5
Kinner Airplane & Motor Corporation
Glendale, California



Specifications: Length overall (less starter), 32-5/16 inches. Diameter overall, 45¾ inches. Mounting bolt diameter, 14 inches. Bore, 4.25 inches. Stroke, 5.25 inches. Displacement, 372 cubic inches. Weight dry (less hub and starter), 280 pounds. Fuel consumption, .50 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower per hour.

The Kinner K-5 is a five-cylinder four-cycle air-cooled radial-type aircraft engine of 100 horsepower at 1,810 revolutions per minute. Compression ratio is 5. Dual Scintilla magnetos are provided. Carburetor is Holley or Stromberg. The lubrication system is the circulating oil type with pressure feed to main bearings and to link pins. There is one intake and one exhaust valve per cylinder. Propeller drive is direct. Starter is provided for, either Heywood or Eclipse hand turning gear or Eclipse electric. The pistons are of the slipper type and are aluminum alloy. There are three compression rings and one oil ring per cylinder. The cylinder heads are constructed of aluminum alloy. The cylinder barrels are steel. The crankcase is aluminum alloy. In the construction of the Kinner K-5 aircraft engine, the front exhaust heads make possible the use of exhaust collector ring.

A single-piece counterbalanced crankshaft of alloy steel, heat treated and ground, is carried on combination ball and babbitt bearings; the ball bearing is so located that it takes the thrust load.



KINNER
B-5
Kinner Airplane & Motor Corporation
Glendale, California

Specifications: Length overall (less starter), 32-1/16 inches. Diameter overall, 45¾ inches. Mounting bolt diameter, 14 inches. Bore, 4⅝ inches. Stroke, 5¼ inches. Displacement, 441 cubic inches. Weight dry (less hub and starter), 295 pounds. Fuel consumption, .50 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower per hour.

The Kinner B-5 is a radial-type air-cooled engine of five cylinders with a four-stroke cycle. A total of 125 horsepower is developed at 1,925 revolutions per minute. Compression ratio is 5.2. Dual Scintilla magnetos are provided. One Stromberg or one Holley carburetor is provided as desired. There are two valves per cylinder, one intake valve and one exhaust valve. Propeller drive is direct. Heywood or Eclipse hand-turning gear starter, or Eclipse electric starter is provided for. The pistons are the full-skirt type and are constructed ol aluminum alloy. There are three compression rings per cylinder, one oil. The cylinder heads are aluminum alloy. The cylinder barrels are steel. The crankcase is aluminum alloy.

Cylinders are finished in high grade black enamel, crankcase battleship grey, and all steel coated to prevent corrosion.

The lubrication system is high pressure force feed through the hollow crankshaft to main and rod bearings with a separate scavenger pump for oil return to outside oil tank of airplane.

KINNER
C-5
Kinner Airplane & Motor Corporation
Glendale, California



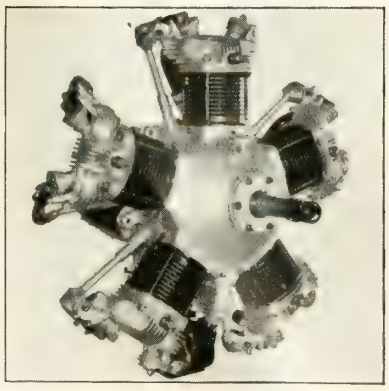
Specifications: Length overall (less starter), 36¼ inches. Diameter overall, 50 inches. Mounting bolt diameter, 19¼ inches. Bore, 5⅝ inches. Stroke, 5¾ inches. Displacement, 715 cubic inches. Weight dry (less hub and starter), 420 pounds. Fuel consumption, .50 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower per hour.

The Kinner C-5 is a five-cylinder four-cycle air-cooled radial-type aircraft powerplant developing 210 horsepower at 1,900 revolutions per minute. Compression ratio is 5.2. Dual Scintilla magnetos are provided. Carburetor is Stromberg. The lubrication system is the circulating oil type, pressure feed to main bearings and link pins. There are two valves per cylinder, one intake and one exhaust. Propeller drive is direct. Starter is Eclipse electric inertia, or Eclipse hand ineritia, or Heywood or Eclipse direct electric. The pistons are the full-skirt type, constructed of aluminum alloy. There are three compression rings per cylinder, one oil ring. The cylinder heads are aluminum alloy. The cylinder barrels are steel. The crankcase is aluminum alloy.

Accessories include collector ring. Provision is made for standard 15 and 20 ampere generator and a fuel pump.

This engine can be used either as tractor or pusher.

Standard S. A. E. propeller end of crankshaft provides for use of minimum weight of metal propeller hub.



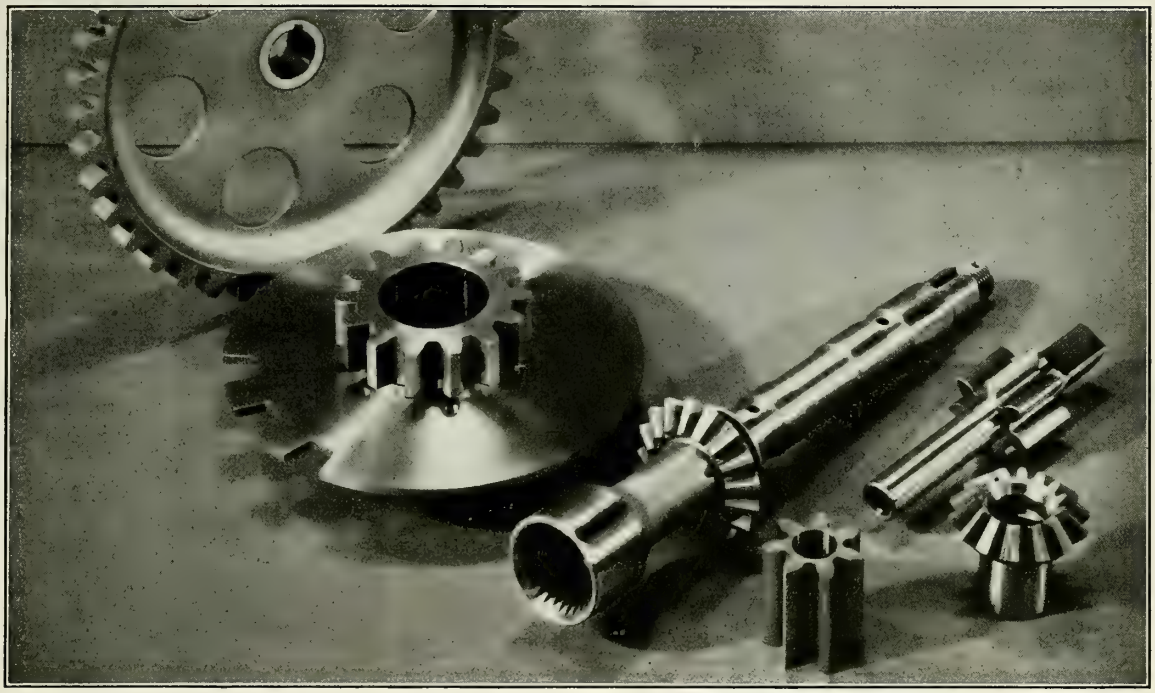
LAMBERT
R-266
Lambert Aircraft Engine Corporation
Moline, Illinois

Specifications: Length overall (less starter), 30⅜ inches. Diameter overall, 33 inches. Mounting bolt diameter, 13¾ inches. Bore, 4¼ inches. Stroke, 3¾ inches. Displacement, 266 cubic inches. Weight dry (less hub and starter, 214 pounds. Fuel consumption, .57 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower per hour.

The Lambert R-266 is a five-cylinder four-cycle air-cooled radial aircraft powerplant developing 90 horsepower at 2,375 revolutions per minute. Compression ratio is 5.55. Dual Scintilla magnetos are standard equipment. Carburetor is Stromberg NAR-3. The lubrication system is pressure and dry sump. There are two valves per cylinder, one intake valve and one exhaust valve, Silchrome. The propeller drive is direct. The starter provided for is Eclipse Y-150 direct electric.

The pistons are of the trunk type, Lynite, made by the Aluminum Company of America. There are four Pedric piston rings per piston. The cylinder heads are Lynite and are removable. The cylinder barrels are nickel semi-steel castings. The crankcase is of the barrel type split on cylinder center line, magnesium alloy, product of the Bohn Aluminum and Brass company.

Equipment includes Champion spark plugs, two per cylinder, propeller hub, exhaust ring, carburetor, air heater and muffler, tool kit. Accessories and drives are grouped at the rear.



"Ex-Cell-O Precision" *is available in Aircraft Engine Parts*

Years of experience in the handling of this particular type of product; the most modern and efficient plant equipment; and a personnel composed of specialists in each field of production, have combined to make the name "Ex-Cell-O" a synonym for precision!

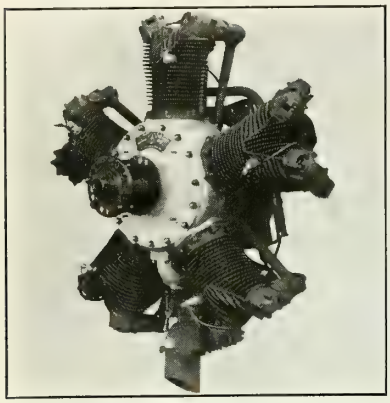
Ex-Cell-O's plant equipment provides facilities for complete production from raw materials to finished parts. The Ex-Cell-O aircraft booklet will be mailed upon request.

EX-CELL-O

AIRCRAFT & TOOL CORPORATION

1200 OAKMAN BOULEVARD XLO DETROIT, MICHIGAN

NEW YORK · CHICAGO · BUFFALO · CLEVELAND · DAYTON



LeBLOND

5-DE

LeBlond Aircraft Engine Corporation
Cincinnati, Ohio

Specifications: Length overall (less starter), 22¼ inches. Diameter overall, 33¼ inches. Mounting bolt diameter, special four-point mounting. Bore, 4¼ inches. Stroke, 3¾ inches. Displacement, 250.5 cubic inches. Weight dry (less hub and starter), 235 pounds. Fuel consumption, .60 pounds per horsepower per hour. Oil consumption, .015 pounds per horsepower per hour.

The LeBlond 5-DE is a five-cylinder four-cycle air-cooled radial aircraft powerplant developing 70 horsepower at 1,950 revolutions per minute. Compression ratio is 5.35. Dual Bosch magnetos are provided. Carburetor is Holley. The lubrication system is dry sump, pressure feed. There are two valves per cylinder, one intake valve and one exhaust valve, Rich. The propeller drive is direct. Standard S.A.E. flange is provided for starter.

The pistons are Permite Aluminum Industries. There are two compression rings per piston, product of the Perfect Circle company, and one oil control ring, Simplex. They are located above the piston pin which is full floating in both piston and connecting rod. The cylinder heads are one-piece molybdenum cast iron. The cylinder barrels are one-piece molybdenum cast iron. The crankcase is of the barrel type, 195 h.t. alloy.

This engine is especially designed for installation on one-place and two-place ships for the private owner or training purposes.

LeBLOND

5-DF

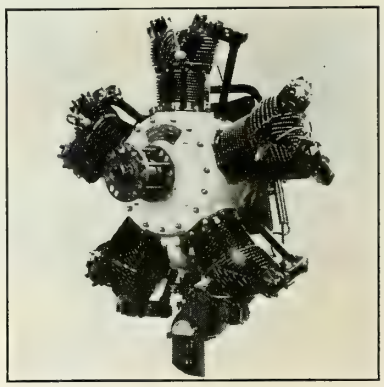
LeBlond Aircraft Engine Corporation
Cincinnati, Ohio

Specifications: Length overall (less starter), 22¼ inches. Diameter overall, 33¼ inches. Mounting bolt djameter, special four-point mounting. Bore, 4¼ inches. Stroke, 3¾ inches. Displacement, 266 cubic inches. Weight dry (less hub and starter), 219 pounds. Fuel consumption, .52 pounds per horsepower per hour. Oil consumption, .015 pounds per horsepower per hour.

The LeBlond 5-DF is a five-cylinder four-cycle air-cooled radial aircraft powerplant developing 85 horsepower at 2,125 revolutions per minute. Compression ratio is 5.4. Dual Bosch magnetos are standard equipment. Holley carburetor is provided. The lubrication system is dry sump, pressure feed. There are two valves per cylinder, one intake valve and one exhaust valve, Rich. Starter provided for is standard S.A.E. flange.

The pistons are Lynite, product of the Aluminum Company of America. There are two compression rings per piston, product of the Perfect Circle company, and one oil control ring per piston, Simplex. They are located above the piston pin which is full floating in both piston and connecting rod. The cylinder heads are bolted on, Y alloy. The cylinder barrels are steel with integral cooling fins. The crankcase is of the barrel type, 195 h.t. alloy.

This engine is especially designed for installation in one-place and two-place ships for the private owner or for training purposes.





LeBLOND

7-DF

LeBlond Aircraft Engine Corporation
Cincinnati, Ohio

Specifications: Length overall (less starter), 23.06 inches. Diameter overall, 33¼ inches. Mounting bolt diameter, special four-point mounting. Bore, 4¼ inches. Stroke, 3¾ inches. Displacement, 372 cubic inches. Weight dry (less hub and starter), 275 pounds. Fuel consumption, .54 pounds per horsepower per hour. Oil consumption, .015 pounds per horsepower per hour.

The LeBlond 110 7-DF is a seven-cylinder four-cycle air-cooled radial aircraft powerplant developing 110 horsepower at 2,150 revolutions per minute. Compression ratio is 5.4. Dual Scintilla magnetos are standard equipment. Single Stromberg or Holley carburetor is optional. The lubrication system is dry sump, full pressure. There are two valves per cylinder, one intake valve and one exhaust valve, Rich. Standard S.A.E. flange is provided for starter.

The pistons are Lynite, Aluminum Company of America product. There are two compression rings per piston, product of the Perfect Circle company, and one oil control ring, Simplex. They are located above the piston pin which is full floating in both piston and connecting rod. The cylinder heads are bolted on, Y alloy. The cylinder barrels are steel with integral cooling fins. The crankcase is of the barrel type, 195 h.t. alloy.

This engine is especially designed for installation on one-place or two-place ships for the private owner or for training purposes.

LIGHT

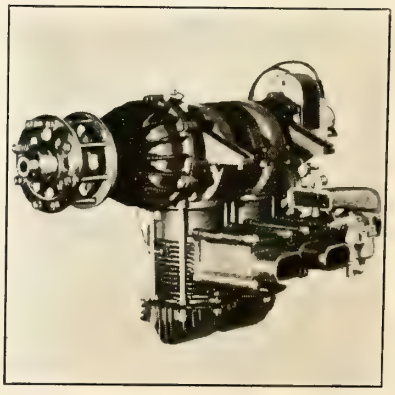
TIGER KITTEN 20 AND 30

Light Manufacturing and Foundry Company
Pottstown, Pennsylvania

Specifications: (Models 20 and 30 respectively); 24½ inches; 28 inches. Height overall, 17¼ inches. Width overall, 12 inches. Bore, 3¾ inches. Stroke, 3½ inches. Displacement, 77 cubic inches. Weights dry, 80; 95 pounds. Fuel and oil consumption, .65 pounds per horsepower per hour.

The Light Tiger Kitten 20 is a two-cylinder air-cooled in-line inverted aircraft powerplant developing 20 brake horsepower at 2,400 revolutions per minute. The Tiger Kitten 30 is a two-cylinder geared air-cooled in-line inverted aircraft powerplant developing 25 brake horsepower at 3,000 crankshaft revolutions per minute; 1,500 propeller revolutions per minute. Compression ratio on both models is 5.3. Both models have a single carburetor and a single magneto. The lubrication system is forced feed throughout. The cylinder heads are Y alloy, cylinder barrels cast-nickel iron, with integral fins, bolted to crankcase with long hold down bolts passing through head. The pistons are Y alloy and there are five rings per piston. Connecting rods are forged steel "I" section, roller bearing. The crankshaft is two-throw, one piece. The crankcase is aluminum alloy No. 195, heat treated, split on center line of shaft.

There are two power impulses per propeller revolution on Model 20 and four power impulses per revolution on Model 30. There are eight moving parts on Model 20, and 10 moving parts on Model 30.

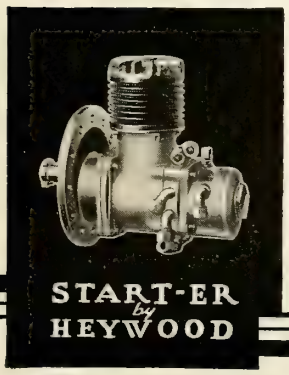


FIRST *Commercial Auto-Giro in the United States, manufactured by* PITCAIRN AIRCRAFT INC., *is* HEYWOOD EQUIPPED



HEYWOOD STARTERS

SKY SERVICE



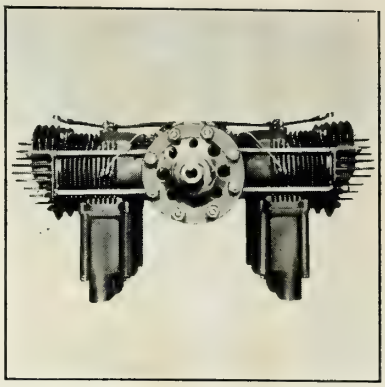
The Detroit News Autogiro is the first commercial plane of this type in the United States. In keeping with the other features of great safety and convenience incorporated in the Autogiro, Pitcairn has equipped this plane with a Heywood Starter.

In no other aircraft in the world is stability, safety and convenience so combined as in the Autogiro and in no other starter are these vital factors so easily apparent.

Dependable at all times, under all climatic conditions —a touch on the starter button brings instant response and assures a quick, easy start from the pilot's seat.

SKY SPECIALTIES CORPORATION
3651 Hart Avenue Detroit, Michigan

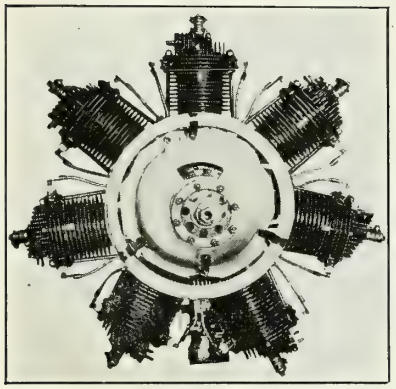
LIGHT
TIGER JUNIOR 50
Light Manufacturing and Foundry Company
Pottstown, Pennsylvania



Specifications: Length overall, 32 inches. Height overall, 16⅜ inches. Width overall, 26 inches. Bore, 3¾ inches. Stroke, 3½ inches. Displacement, 154 cubic inches. Weight dry, 160 pounds. Fuel and oil consumption, .65 pounds per horsepower per hour.

The Light Tiger Junior 50 is a four-cylinder geared air-cooled horizontal double-opposed aircraft powerplant developing 50 brake horsepower at 3,000 crankshaft revolutions per minute; 1,500 propeller revolutions per minute. Compression ratio is 5.3. One double carburetor and dual magnetos are standard equipment. The lubrication system is forced feed throughout. The pistons are Y alloy. There are five rings per piston. The cylinder heads are Y alloy, cylinder barrels cast-nickel iron integral fins, bolted to crankcase with long hold down bolts passing through head. The connecting rods are forged steel "I" section roller bearing. The crankshaft is four-throw, one-piece chrome nickel steel, drop forgings. The crankcase is aluminum alloy No. 195, heat treated.

Firing order is 1, 2—3, 4. Increased propeller efficiency due to propeller speed is approximately 15 per cent, according to engineers of the Light company. There are eight power impulses per propeller revolution. There are 18 moving parts. The manufacturers claim for the engine light weight, low head resistance and accessibility of all parts.



LIGHT
TIGER 100
Light Manufacturing and Foundry Company
Pottstown, Pennsylvania

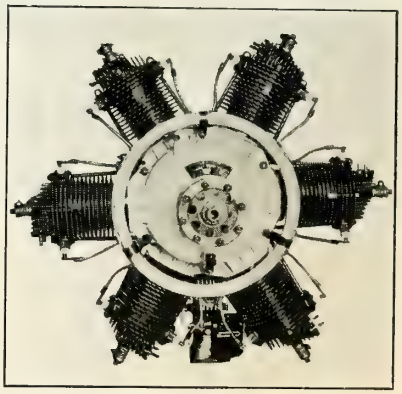
Specifications: Diameter overall, 37 inches. Bore, 4 13/100 inches. Stroke, 4 93/100 inches. Displacement, 397 cubic inches. Weight dry, 278 pounds. Fuel consumption, .54 pounds per horsepower per hour. Oil consumption, .015 pounds per horsepower per hour.

The Light Tiger 100 is a six-cylinder radial air-cooled aircraft powerplant developing 100 brake horsepower at 1,800 revolutions per minute. Compression ratio is 4.8. Two dual magnetos are provided, Scintilla or Bosch optional. Zenith, Stromberg or Holley carburetor is optional. The lubrication system is dry sump, forced feed to all bearings through hollow crankshaft with pressure relief valve in front of the main bearing.

The cylinder heads are Y alloy, cylinder barrels cast nickel-iron with integral fins, bolted to crankcase with long bolts passing through crankcase. The pistons are Y alloy. There is a unique connecting rod assembly. The crankshaft is two throw, one piece. The crankcase is 195 alloy. The valve gear is the normal type with push rods, rockers and double valve springs.

Disassembly and reassembly of this engine may be accomplished by two men in three hours without removing rear half of the crankcase from ship. The cylinders and inlet pipes are removable without disturbing cowling or gaskets. The entire engine and propeller thrust are supported upon an alloy steel frame.

LIGHT
TIGER 125
Light Manufacturing and Foundry Company
Pottstown, Pennsylvania



Specifications: Diameter overall, 39 inches. Bore, 4 13/100 inches. Stroke, 4 93/100 inches. Displacement, 464 cubic inches. Weight dry, 288 pounds. Fuel consumption, .54 pounds per horsepower per hour. Oil consumption, .015 pounds per horsepower per hour.

The Light Tiger 125 is a seven-cylinder radial air-cooled aircraft powerplant developing 125 brake horsepower at 1,850 revolutions per minute. Compression ratio is 5. Two dual magnetos are provided, Bosch or Scintilla optional. Zenith, Holley or Stromberg carburetor is optional. The lubrication system is dry sump, forced feed to all bearings through hollow crankshaft, with pressure relief valve in front of the main bearing.

The cylinder heads are Y alloy, cylinder barrels cast-nickel iron with integral fins, bolted to crankcase with long bolts passing through crankcase. The pistons are Y alloy. Connecting rod is conventional (master rod). The crankshaft is single throw, one piece. The crankcase is 195 alloy. The valve gear is the normal type with push rods, rockers and double valve springs.

Disassembly and reassembly of this engine may be accomplished by two men in three hours without removing rear half of crankcase from ship.

The cylinders and inlet pipes are removable without disturbing cowling or gaskets. The entire engine and propeller thrust are supported upon an alloy steel frame.



LYCOMING
R-680
Lycoming Manufacturing Company
Williamsport, Pennsylvania

Specifications: Length overall (less starter), 32⅝ inches. Diameter overall, 43¼ inches. Mounting bolt circle diameter, 19¼ inches. Bore, 4⅝ inches. Stroke, 4½ inches. Displacement, 680.4 cubic inches. Weight dry (less hub and starter), 475 pounds. Fuel consumption, .55 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower per hour.

The Lycoming R-680 is a nine-cylinder four-cycle air-cooled radial-type aircraft engine of 215 horsepower at 2,000 revolutions per minute. Compression ratio is 5.3. Dual vertical Scintilla magnetos and two Scintilla distributors are provided. Carburetor is single-barrel type, Stromberg NA-R7. The lubrication system involves one pressure and two scavenger pumps built in one unit. There is one intake valve and one exhaust valve per cylinder. Propeller drive is direct. The pistons are permanent mould, ribbed, and of four per cent copper aluminum alloy. There are four piston rings per piston. The cylinder heads are cast aluminum alloy, ten per cent copper. The cylinder barrels are S.A.E. 1050 steel. The crankcase is cast aluminum alloy.

The accessories drive shaft is an alloy steel shaft, splined to the rear half of the crankshaft, and runs in the self-aligning bearing carried in the rear accessories housing. This shaft carries the accessories drive gears and starter jaw. The engine is provided with a starter drive operating directly on an extension of the crankshaft.



Marcel Doret's world's record Dewoitine plane displayed at the Paris Aviation Salon. His 500 h.p. Hispano Suiza engine was equipped with Champion Aero A spark plugs when he broke the world's record for 1000 kilometres (625 miles) at 178¾ miles per hour.

Now every engine becomes a better engine

CHAMPION AERO TYPE spark plugs are gaining wider acceptance for aircraft engines every day simply because with a set installed every engine becomes a better engine.

No other aircraft spark plug combines the performance capacity and the unqualified dependability of the specially designed, specially constructed Champion Aero Type.

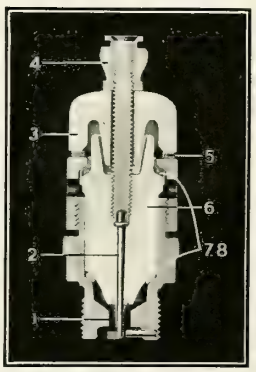
They afford practical immunity from pre-ignition and fouling.

The exclusive Champion sillimanite insulators (not porcelain) are so designed that the primary is protected by the secondary "dome" insulator, *positively preventing interference with engine operation*, in the remote possibility of breakage.

Because of this new factor of safety for aircraft engines, Champions are enjoying a rapidly growing demand from transport lines, mail lines, racing flyers and private owners alike.

Install a set of Champion Aero Type spark plugs in your plane today. They are the ready means of making every aircraft engine a better engine. Better in performance. Better in dependability. That is why Champion Spark Plugs for all engines, excel and outsell the world over.

Concentration on this one type spark plug for practically all aircraft engines enables Champion, through large production, to offer this vastly superior spark plug at the extremely low price of $1.25.



Champion Aero A Exclusive Features

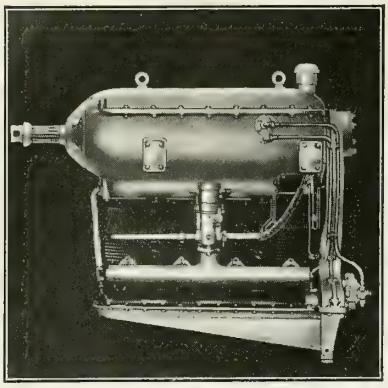
1. Restricted bore. 2. Special analysis electrode. 3. Secondary sillimanite dome insulator. 4. Welded steel terminal. 5. Copper seal. 6. Primary sillimanite insulator. 7-8. Molded copper gasket seals.

New Improved

CHAMPION

Spark Plugs for Aviation

TOLEDO, OHIO **WINDSOR, ONT.**



MARTIN

333

Glenn L. Martin Motors Company
Baltimore, Maryland

Specifications: Length overall (less starter), 42¼ inches. Height overall, 33 inches. Mounting bolt centers, 11 inches, (between mounting pads). Bore, 4½ inches. Stroke, 5¼ inches. Displacement, 333 cubic inches. Weight dry (less hub and starter), 260 pounds. Fuel consumption, .48 pounds per horsepower per hour. Oil consumption, .010 pounds per horsepower per hour.

The Martin 333 is a four-cylinder four-cycle air-cooled inverted in-line aircraft powerplant developing 120 horsepower at 2,100 revolutions per minute. Compression ratio is 5.3. Dual Scintilla magnetos are provided. The carburetor is Zenith, down draft. The lubrication system is full pressure, dry sump, dual gear pump. There are two valves per cylinder, one intake valve and one exhaust valve, Rich. The propeller drive is direct. Standard S.A.E. flange is provided for starter.

The pistons are of the trunk type, aluminum alloy, Bohn Aluminum and Brass Corporation. There are three compression rings, one oil ring, per piston, American Hammered. The cylinder heads are of the dome type, cast of Y alloy and made by the Bohn Aluminum and Brass Corporation.

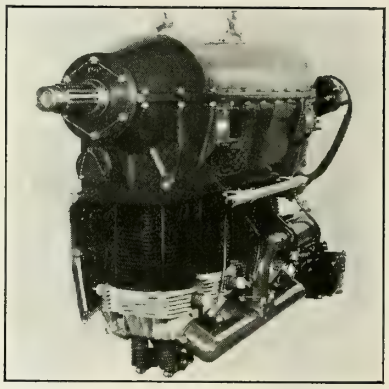
Special equipment includes underhead valves and lubricated valve stems which are incorporated in the construction of this engine. No hand oiling and no adjustments on valves are required.

Two lighting lugs are provided.

MENASCO

PIRATE B-4

Menasco Motors, Inc.
Los Angeles, California

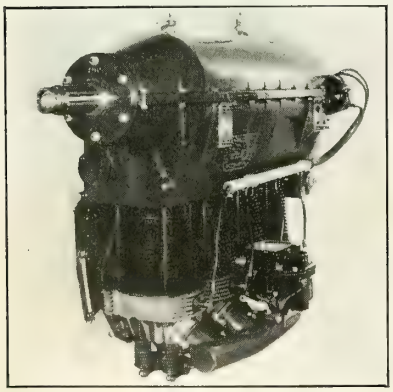


Specifications: Length overall (less starter), 46-13/16 inches. Height overall, 28 inches. Mounting bolt centers, 11⅛ inches (between engine support pads). Bore, 4½ inches. Stroke, 5⅛ inches. Displacement, 326 cubic inches. Weight dry (less hub and starter), 280 pounds. Fuel consumption, .54 pounds per horsepower per hour. Oil consumption, .006 pounds per horsepower per hour.

The Menasco Pirate B-4 is a four-cylinder four-cycle air-cooled inverted in-line aircraft powerplant developing 95 horsepower at 2,000 revolutions per minute. Compression ratio is 5.5. Scintilla or Bosch magneto is optional. Carburetion system is updraft; carburetor is Stromberg. The lubrication system is dry sump, force feed to bearings, scavenge front and rear of crankcase with two independent scavenging oil pumps. There are two valves per cylinder, one intake valve and one exhaust valve, made by Thompson. The starter provided for is S.A.E. small type mounting, four-to-one Eclipse hand cranking gear or Y-150 electric.

The pistons are of the full-skirt type, Lynite, Aluminum Company of America. There are three compression rings, one oil scraper, per piston. The cylinder heads are detachable, aluminum alloy, Aluminum company. The cylinder barrels are nickel cast iron, Chenny. The crankcase is aluminum alloy, Aluminum company.

For additional information ese advertisement on pages 158-159 of this issue



MENASCO

PIRATE C-4

Menasco Motors, Inc.
Los Angeles, California

Specifications: Length overall (less starter), 46-13/16 inches. Height overall, 28 inches. Mounting bolt centers, 11⅛ inches (between engine support pads). Bore, 4¾ inches. Stroke, 5⅛ inches. Displacement, 363 cubic inches. Weight dry (less hub and starter), 275 pounds. Fuel consumption, .50 pounds per horsepower per hour. Oil consumption, .010 pounds per horsepower per hour.

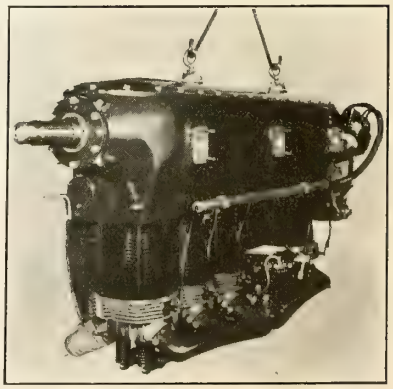
The Menasco Pirate C-4 is a four-cylinder four-cycle air-cooled inverted in-line aircraft powerplant developing 125 horsepower at 2,175 revolutions per minute. Compression ratio is 6.5. Single Scintilla or Bosch magnetos are optional. The carburetion system is downdraft, Stromberg carburetor. The lubrication system is dry sump, forced feed to bearings, scavenge front and rear crankcase with two independent scavenging oil pumps. There are two valves per cylinder, one intake valve and one exhaust valve, made by the Thompson company. S.A.E. small tye mounting is provided for starter—four-to-one Eclipse handcranking gear or Y-150 electric. The propeller drive is direct. No. 10 S.A.E. splined shaft.

The piston rings are of the full-skirt type, Lynite, Aluminum Company of America. There are three compression rings, one oil scraper, per piston. The cylinder heads are detachable, aluminum alloy, Aluminum company. The cylinder barrels are cast iron, Chenny. The crankcase is aluminum alloy, Aluminum company.

MENASCO

BUCCANEER B-6

Menasco Motors, Inc.
Los Angeles, California

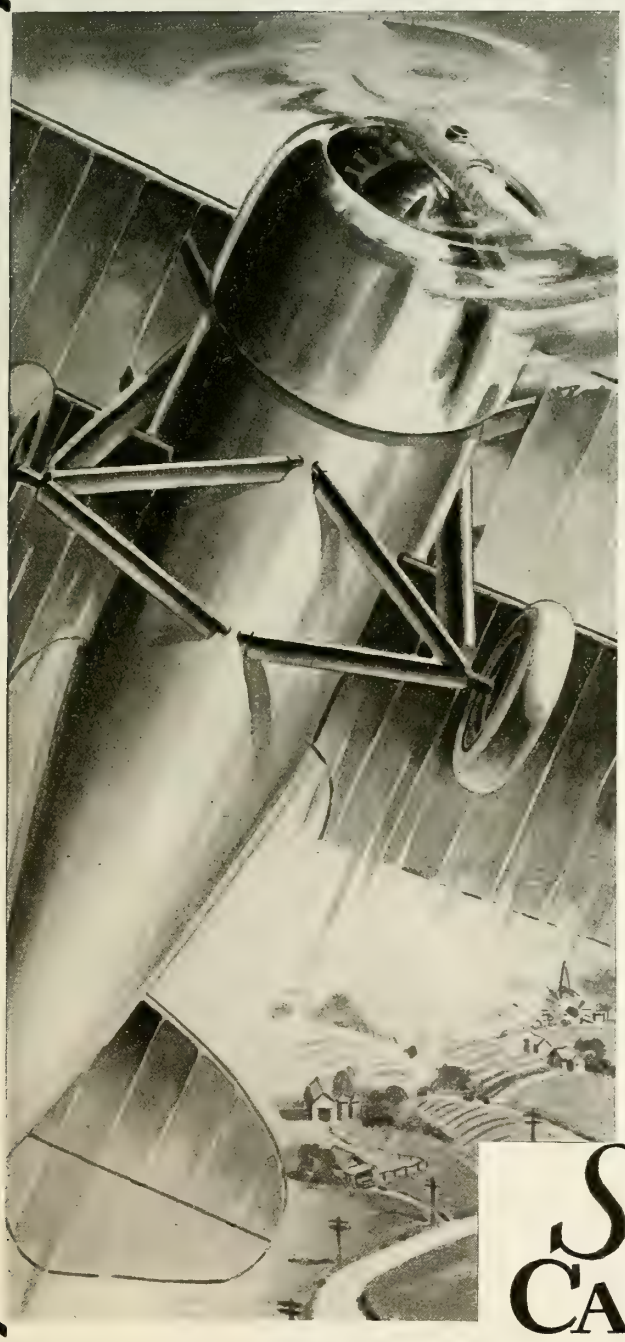


Specifications: Length overall (less starter), 58-7/16 inches. Height overall, 28 inches. Mounting bolt centers, 11⅛ inches (between engine support pads). Bore, 4½ inches. Stroke, 5⅛ inches. Displacement, 489 cubic inches. Weight dry (less hub and starter), 365 pounds. Fuel consumption, .54 pounds per horsepower per hour. Oil consumption, .006 pounds per horsepower per hour.

The Menasco Buccaneer B-6 is a six-cylinder four-cycle air-cooled inverted in-line aircraft powerplant developing 160 horsepower at 1,975 revolutions per minute. Compression ratio is 5.5. Single Bosch magneto is provided. The carburetion system is Duplex downdraft and carburetor is Stromberg. The lubrication system is dry sump, forced feed to bearings, scavenge front and rear of crankcase with two independent scavenging oil pumps. There are two valves per cylinder, one intake valve and one exhaust valve made by Thompson. S.A.E. large type mounting is provided for hand inertia or electric starter. The propeller drive is direct, No. 10 S.A.E. splined shaft end.

The pistons are of the full-skirt type, Lynite, Aluminum Company of America. There are three compression rings, one oil scraper, per piston. The cylinder heads are detachable, aluminum alloy, Aluminum company. The cylinder barrels are cast iron, Chenny. The crankcase is aluminum alloy, Aluminum company.

Zooming Power

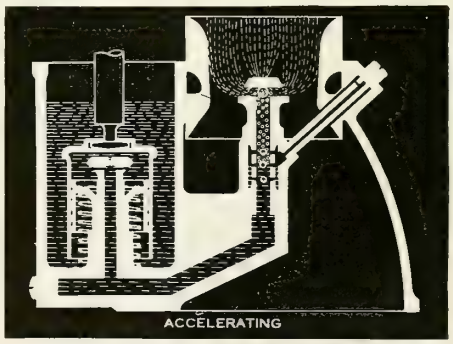


WHEN a pilot opens the throttle quickly, he wants smooth and positive acceleration. It is his greatest factor of safety in many tight situations.

Temporary enrichment of mixture required for such acceleration is automatic with Stromberg Aircraft Carburetors. That's why so many good pilots prefer them. The accelerating pump, for use on engines which require a large accelerating charge for cold weather operation, is a new and exclusive Stromberg construction. It gives a positive and definite accelerating charge, under all conditions, regardless of the situation existing in the carburetor. This charge is delivered in a momentary spurt of fuel followed by a sustained discharge, lasting several seconds.

Stromberg's background represents 22 years of experience and research. Perhaps their engineers can be of service to you.

Stromberg Carburetors are used on over 95% of the aircraft engines now being built in the United States



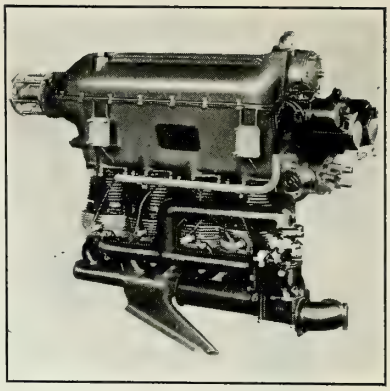
STROMBERG CARBURETORS

BENDIX STROMBERG CARBURETOR COMPANY

«DIVISION OF BENDIX AVIATION CORPORATION»

701 BENDIX DRIVE • SOUTH BEND, INDIANA

MICHIGAN
ROVER L-267
Michigan Aero-Engine Corporation
Lansing, Michigan

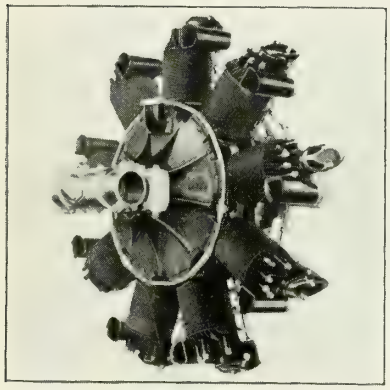


Specifications: Length overall (less starter), 42¼ inches. Height overall, 31⅞ inches. Mounting bolt centers, 14 inches. Bore, 4⅛ inches. Stroke, 5 inches. Displacement, 267.28 cubic inches. Weight dry (less starter), 230-232 pounds. Fuel consumption, .055 pounds per horsepower per hour. Oil consumption, .010 pounds per horsepower per hour.

The Rover L-267 is an in-line inverted four-cylinder four-cycle air-cooled powerplant developing 75 horsepower at 1,975 revolutions per minute. Compression ratio is 5.10. Dual Scintilla magnetos are provided. Carburetor is Stromberg. The lubrication system is dry sump, full pressure to all bearings. There is one intake and one exhaust valve per cylinder. Valves are of Rich manufacture. Spark plugs are Champion or A.C. Propeller drive is direct.

The pistons are full-trunk type, permanent mould, produced by the Aluminum Company of America. The piston rings are Perfect Circle, four per piston. The cylinder heads are Aluminum Company of America aluminum alloy. The cylinder barrels are cast nickel iron produced by the Ryan Foundry Company. The crankcase is aluminum alloy casting produced by the Aluminum Company of America.

A starter is not furnished as regular equipment but provision is made for the various types now on the market. Four mounting bolts are used and all controls are arranged at the rear.



PACKARD
DIESEL DR-980
Packard Motor Car Company
Detroit, Michigan

Specifications: Length overall (less starter), 36¾ inches. Diameter overall, 45-11/16 inches. Mounting bolt diameter, 22 inches. Bore, 4-13/16 inches. Stroke, 6 inches. Displacement, 982 cubic inches. Weight dry (less hub and starter), 520 pounds. Fuel consumption, .4 pounds per horsepower per hour. Oil consumption, .035 pounds per horsepower per hour.

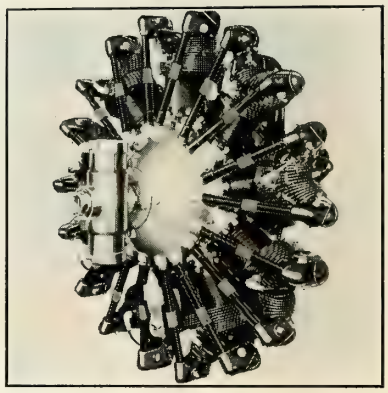
The Packard Diesel DR-980 is a nine-cylinder four-cycle air-cooled radial aircraft powerplant developing 225 horsepower at 1,950 revolutions per minute. The ignition system is compression ignition. The lubrication system is full pressure. There is one valve per cylinder. The propeller drive is direct through a flexible rubber mounting. Starter provided for in the construction of this powerplant is hand and electric inertia.

The pistons are aluminum alloy. There are four piston rings per piston, two Doulbe Seal compression rings and two oil rings. The cylinder heads are aluminum alloy. The cylinder barrels are all-steel.

The engine is started by means of an inertia starter commonly used with gasoline powerplants. The engine is stopped by closing the throttle completely against a spring stop: this restricts the stroke of the fuel pumps until the pump plunger barely rides higher than the pump inlet port and forces no fuel into the nozzle.

For additional information see advertisement on page 167 of this issue

PRATT & WHITNEY
WASP JUNIOR AND S-1-A
Pratt & Whitney Aircraft Company
Hartford, Connecticut



Specifications: Length overall (less starter), 41-1/16 inches. Diameter overall, 45¾ inches. Mounting bolt diameter, 23⅜ inches. Bore, 5-3/16 inches. Stroke, 5-3/16 inches. Displacement, 985 cubic inches. Weight dry (less hub and starter), 560 pounds. Fuel consumption, .55 pounds per horsepower per hour. Oil consumption, .035 pounds per horsepower per hour.

Both are nine-cylinder four-cycle air-cooled radial powerplants. The Junior develops 300 horsepower at 2,000 r.p.m.; S-1-A, 400 at 2,300 r.p.m. Compression ratio is 5. Dual Scintilla magnetos are provided. The carburetion system employs a single Stromberg carburetor and General Electric rotary induction system. The lubrication system employs gear-type pressure pump to all main bearings and scavenger pump from sump. There are two valves per cylinder, one intake valve and one exhaust valve, made by the Thompson company. Propeller drive is direct. The starter provided for is optional.

The pistons are of the trunk type, made by the Aluminum company. There are four piston rings per piston, U.S. or American Hammered. The cylinder heads are cast integral with rocker boxes and are aluminum, Aluminum company. The cylinder barrels are machined forgings. Bethlehem or Tioga steel. The crankcase main section is of forged aluminum.

For additional information see advertisement on second cover of this issue



PRATT & WHITNEY
WASP SERIES C AND SC
Pratt & Whitney Aircraft Company
Hartford, Connecticut

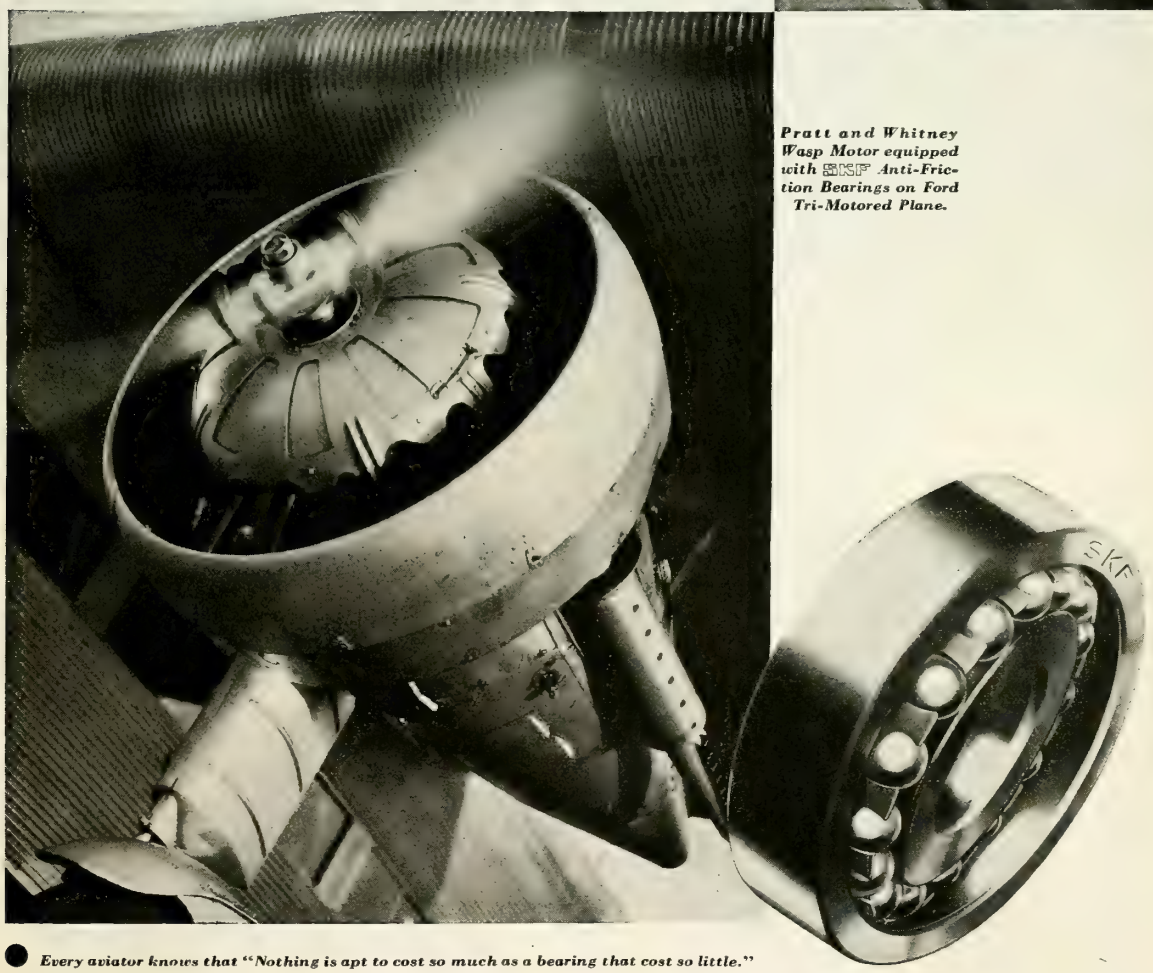
Specifications: Length overall (less starter), 42-9/16 inches. Diameter overall, 51½ inches. Mounting bolt diameter, 23⅜ inches. Bore, 5¾ inches. Stroke, 5¾ inches. Displacement, 1,344 pounds. Weight dry (less hub and starter), 695 pounds. Fuel consumption, .55 pounds per horsepower per hour. Oil consumption, .035 pounds per horsepower per hour.

Both are nine-cylinder four-cycle air-cooled radial powerplants. Series C develops 420 horsepower at 2,000 revolutions per minute; Series SC, 450 at 2,100 revolutions. Compression ratio is 5.25. Dual Scintilla magnetos are standard equipment. The carburetion system employs dual Stromberg carburetors and General Electric rotary induction system. The lubrication system employs gear-type pressure pump to all main bearings and scavenger pump from sump. There are two valves per cylinder, one intake valve and one exhaust valve, produced by the Thompson company. Propeller drive is direct. The starter provided for is optional.

The pistons are of the trunk type, aluminum, produced by the Aluminum company. There are four piston rings per piston, produced by U.S. or American Hammered. The cylinder heads are aluminum, made by the Aluminum company. The cylinder barrels are machined forgings, Bethlehem or Tioga steel. The main and front sections of the crankcase are aluminum forgings; the blower section is aluminum casting.

WHEN A BEARING FLIES... THERE'S NOTHING BUT PERFORMANCE THAT COUNTS!





Pratt and Whitney Wasp Motor equipped with SKF Anti-Friction Bearings on Ford Tri-Motored Plane.

● *Every aviator knows that "Nothing is apt to cost so much as a bearing that cost so little."*

Along the skyways . . . where chances are always much too long to take . . . where human lives and the development of a new industry depend upon Performance . . . the bearings invariably are SKF.

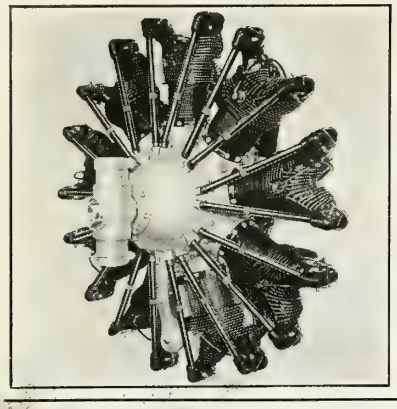
Men who plan and build the things that fly do not buy on price. Price alone *means* nothing up where wing-tips brush cloud-tips in passing. Performance is the only thing that counts.

And so today there are more SKF Anti-Friction Bearings in use on aircraft and aircraft equipment than all other makes of bearings combined. SKF Industries, Inc., 40 East 34th St., New York, N. Y.

SKF

Ball and Roller Bearings

2654



PRATT & WHITNEY
HORNET SERIES A-2
Pratt & Whitney Aircraft Company
Hartford, Connecticut

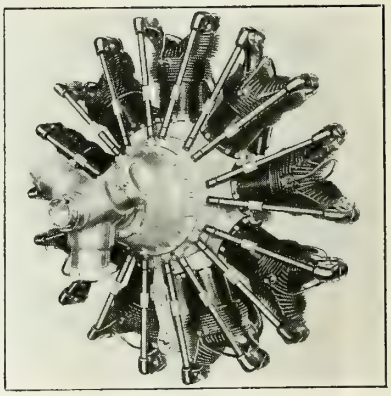
Specifications: Length overall (less starter), 44¾ inches. Diameter overall, 55-7/16 inches. Mounting bolt diameter, 23⅜ inches. Bore, 6⅛ inches. Stroke, 6⅜ inches. Displacement, 1,690 cubic inches. Weight dry (less hub and starter), 775 pounds. Fuel consumption, .55 pounds per horsepower. Oil consumption, .035 pounds per horsepower.

The Pratt & Whitney Hornet Series A-2 is a nine-cylinder four-cycle air-cooled radial aircraft powerplant developing 525 horsepower at 1,900 revolutions per minute. Compression ratio is 5. Dual Scintilla magnetos are provided. Carburetion system is Stromberg and G.E. rotary induction system. The lubrication system employs gear-type pressure pump and scavenger pump from sump. There are two valves per cylinder, one intake valve and one exhaust valve, made by Thompson. Propeller drive is direct. Starter provided for is optional.

The pistons are of the trunk type, aluminum, made by the Aluminum Company of America. There are four piston rings per cylinder, U.S. Hammered or American Hammered. The cylinder heads are aluminum, Aluminum company. The cylinder barrels are steel, Bethlehem or Tioga. The main section of the crankcase is aluminum forgings.

The Hornet Series A-2, provided with reduction gear, has a weight of 840 pounds and develops 500 horsepower at 1,900 revolutions per minute.

PRATT & WHITNEY
HORNET SERIES B
Pratt & Whitney Aircraft Company
Hartford, Connecticut

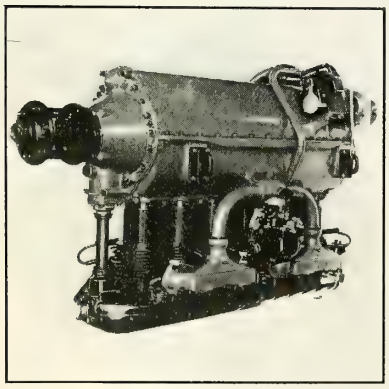


Specifications: Length overall (less starter) 44-13/16 inches. Diameter overall, 56¾ inches. Mounting bolt diameter, 23⅜ inches. Bore, 6¼ inches. Stroke, 6¾ inches. Displacement, 1,860 cubic inches. Weight dry (less hub and starter), 815 pounds. Fuel consumption, .55 pounds per horsepower per hour. Oil consumption, .035 pounds per horsepower per hour.

The Pratt & Whitney Hornet Series B is a nine-cylinder four-cycle air-cooled radial powerplant developing 575 horsepower at 1,950 revolutions per minute. Compression ratio is 5. Dual Scintilla magnetos are provided. The carburetion system employs dual Stromberg carburetors and G. E. rotary induction system. The lubrication system employs gear-type pressure pump to main bearings and scavenging pump from sump. There are two valves per cylinder, one intake valve and one exhaust valve, made by Thompson. Propeller drive is direct. The starter provided for is optional.

The pistons are of the trunk type, aluminum, made by the Aluminum Company of America. There are four piston rings per piston, U. S. or American Hammered. The cylinder barrels are Bethlehem or Tioga steel. The mainsection of the crankcase is aluminum forgings; the nose and blower section, aluminum castings; the rear section, magnesium castings.

This engine is available equipped with a reduction drive gear.



RANGER
6-390
American Airplane and Engine Corp.
Farmingdale, Long Island

Specifications: Length overall (less starter), 50-27/32 inches. Height overall, 31-5/32 inches. Bore, 4 inches. Stroke, 5⅛ iches. Displacement, 386.4 cubic inches. Weight dry (less hub and starter), 350 pounds. Fuel consumption, .55 pounds per horsepower per hour. Oil consumption, .020 pounds per horsepower per hour.

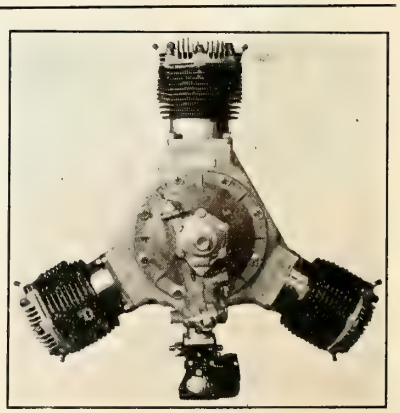
The Fairchild 6-390 is a six-cylinder four-cycle air-cooled in-line inverted aircraft powerplant developing 120 horsepower at 2,150 revolutions per minute. Compression ratio is 5.2. Dual Scintilla magnetos are mounted on either side of the crankcase. Lubrication system is pressure feed. There are two valves per cylinder, one intake valve and one exhaust valve. The propeller drive is direct. Starrter is provided for.

The pistons are of the trunk type, aluminum. There are four rings per piston. The cylinder heads are of the conventional type, aluminum alloy. The cylinder barrels are medium carbon steel.

The lubrication system is full pressure to all moving parts, including cam and valve mechanism. All working parts are completely enclosed. The accessories are arranged at the upper rear of the engine. Provision is made for double tachometer drive, fuel pump, generator and starter drives.

For additional information see advertisement on page 197 of this issue

SZEKELY
SR-3-L
Szekely Aircraft & Engine Company
Holland, Michigan



Specifications: Length overall (less starter), 25 inches. Diameter overall, 30 inches. Mounting bolt diameter, 10 15/16 inches. Bore, 4⅛ inches. Stroke, 4¾ inches. Displacement, 190 cubic feet. Weight dry (less hub and starter), 150 pounds. Fuel consumption, .62 pounds per horsepower. Oil consumption, .009 pounds per horsepower.

The Szekely SR-3-L is a three-cylinder four-cycle air-cooled aircraft powerplant of the L-head type developing 30 horsepower at 1,750 revolutions per minute. Compression ratio is 4.6 Dual magnetos, either Bosch or Scintilla, are provided. Carburetor is Stromberg. The lubrication system involves gear pumps, pressure and scavenger. There is one intake valve and one exhaust valve per cylinder. The propeller drive is direct.

The pistons are aluminum alloy and there are three rings per piston. The cylinder heads are aluminum alloy. The cylinder barrels are cast iron molybdenum. The crankcase is aluminum alloy.

All oil lines are cast integral with gear case sections.

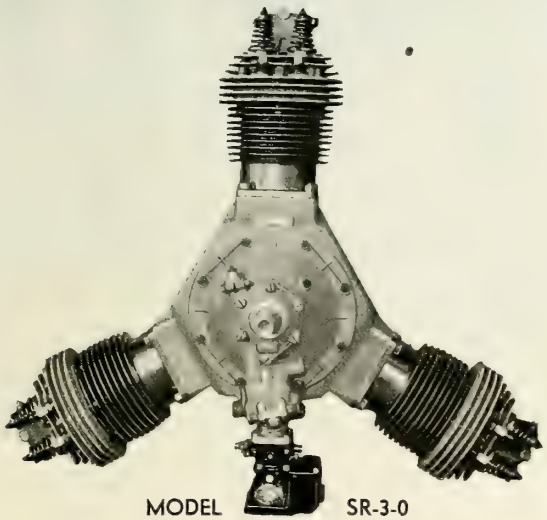
The Szekely SR-3-L is a slow-speed engine, operating most efficiently at between 1,500 and 1,800 revolutions per minute, according to officials of the Szekely company, on the principle that slow speed will result in longer life and better service. This engine is designed particularly for light low-priced aircraft.

For additional information see advertisement on page 155 of this issue

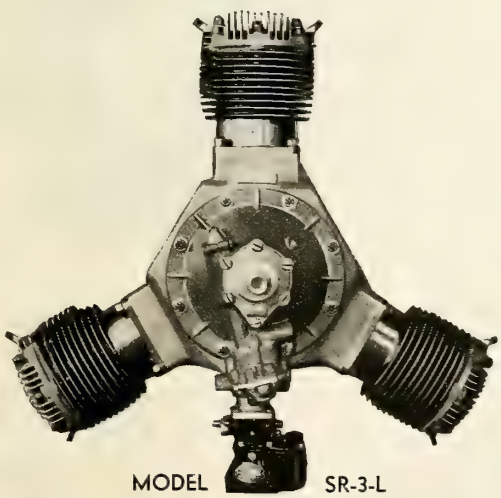
SZEKELY ENGINES

Have Made Possible

LIGHT LOW PRICED AIRCRAFT



MODEL SR-3-0
A. T. C.-70 45 H.P. — 1750 RPM



MODEL SR-3-L
A. T. C.-53 30 H.P. — 1750 RPM

ADOPTED BY

Curtiss-Wright
Buhl Aircraft
American Eagle
Spartan Aircraft
Nicholas-Beazley
Rearwin Aircraft
Liberty Aircraft
Prest Airplane Co.
Harper Aircraft
Crawford Airplane Co.

It's significant, but not surprising, that SZEKELY engines are the choice of those setting the pace in the light plane field.

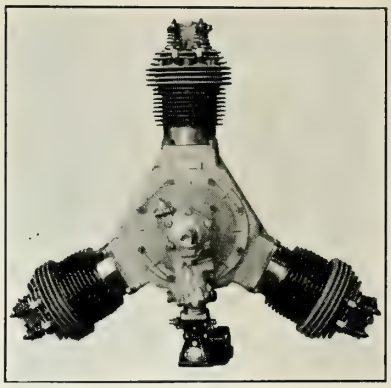
Designed and developed for over two years for this specific service, these engines provide the necessary economy, efficiency and durability, with ample power at slow engine speeds — 1500 to 1800 r.p.m.

SZEKELY AIRCRAFT AND ENGINE COMPANY, HOLLAND, MICHIGAN

SZEKELY

SR-3-0

Szekely Aircraft & Engine Company
Holland, Michigan



Specifications: Length overall (less starter), 25 inches. Diameter overall, 36 inches. Mounting bolt diameter, 10-15/16 inches. Bore, 4⅛ inches. Stroke, 4¾ inches. Displacement, 190 cubic inches. Weight dry (less hub and starter), 150 pounds. Fuel consumption, .62 pounds per horsepower. Oil consumption, .009 pounds per horsepower.

The Szekely SR-3-0 aircraft engine is an overhead-type aircraft powerplant of 45 horsepower at 1,750 revolutions per minute. It is an air-cooled radial-type three-cylinder four-cycle engine. Compression ratio is 4.6. Dual magnetos, either Bosch or Scintilla are provided. Carburetor is Stromberg. The lubrication system involves gear pumps, pressure and scavenger. There is one intake and one exhaust valve per cylinder. The propeller drive is direct.

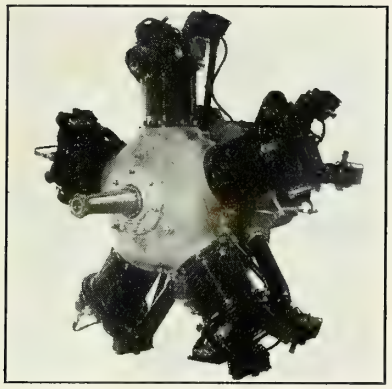
The pistons are aluminum alloy and there are three rings per piston. The cylinder heads are aluminum alloy. The cylinder barrels are of cast iron molybdenum. The crankcase is aluminum alloy.

The Szekely SR-3-0 is a slow speed engine, operating most efficiently at between 1,500 and 1,800 revolutions per minute, with an average cruising speed of approximately 1,600 revolutions per minute, according to officials of the Szekely company, on the principle that slow speed will result in longer life and better service. This engine is designed particularly for light low-priced aircraft.

WARNER

SCARAB JUNIOR '31

Warner Aircraft Corporation
Detroit, Michigan



Specifications: Length overall (less starter), 29 inches. Diameter overall, 36¼ inches. Mounting bolt diameter, 17 inches. Bore, 4¼ inches. Stroke, 4¼ inches. Displacement, 301 cubic inches. Weight dry (less hub and starter), 230 pounds. Fuel consumption, .55 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower per hour.

The Warner Scarab-Junior is a five-cylinder four-cycle air-cooled radial-type aircraft engine of 90 horsepower at 2,025 revolutions per minute. Compression ratio is 5.2. Dual magnetos, either Bosch or Scintilla, are provided. Carburetor is Holley or Stromberg. The dry sump pressure lubrication system is used. There is one intake valve and one exhaust valve per cylinder. Propeller drive is direct. Starter is provided for but is not standard equipment. The pistons are trunk-type aluminum. There are three piston rings per piston, two compression and one oil regulator. The cylinder heads are heat treated aluminum alloy.

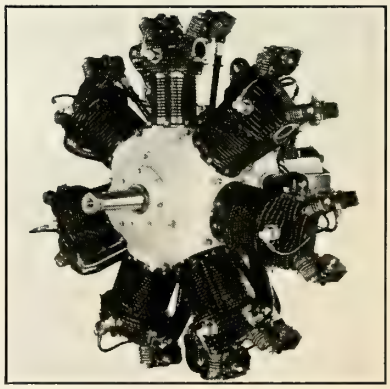
The crankcase is made up in two halves which are joined on the cylinder centerline and are well ribbed. The cylinder assemblies are bolted to the crankcase by means of eight studs each. There are two spark plugs fitted to each cylinder; one in front and the other in the rear. The rocker arm housings are separate castings permanently attached to the cylinder heads.

For additional information see advertisement on page 157 of this issue

WARNER

SCARAB '31

Warner Aircraft Corporation
Detroit, Michigan



Specifications: Length overall (less starter), 29 inches. Diameter overall, 36¼ inches. Mounting bolt diameter, 17 inches. Bore, 4¼ inches. Stroke, 4¼ inches. Displacement, 422 cubic inches. Weight dry (less hub and starter), 285 pounds. Fuel consumption, .55 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower per hour.

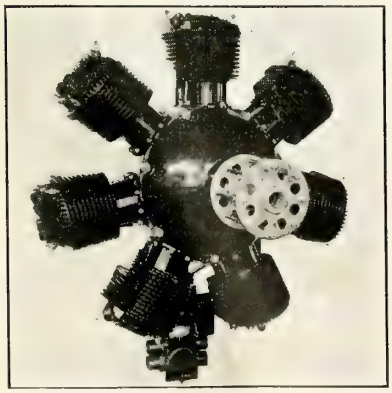
The Warner Scarab '31 is a seven-cylinder four-cycle air-cooled radial-type engine of 110 horsepower at 1,850 revolutions per minute. Compression ratio is 5.2. Dual Scintilla magnetos are provided. Carburetor is Holley or Stromberg. The dry sump pressure lubrication system is used. There is one intake and one exhaust valve per cylinder. Propeller drive is direct. Starter is provided for but is not standard equipment. The pistons are trunk type, aluminum. There are three piston rings per cylinder, two compression and one oil regulator. The cylinder heads are heat treated aluminum alloy. The cylinder barrels are heated treated alloy steel. The crankcase is heat treated aluminum alloy.

The crankcase is made up in two halves which are joined on the cylinder centerline and are well ribbed. The cylinder assemblies are bolted to the crankcase by means of eight studs each. There are two spark plugs fitted to each cylinder; one in front and the other in the rear. The rocker arm housings are separate castings permanently attached to the cylinder heads.

WESTERN

L-7

Western Enterprise Engine Company
Los Angeles, California

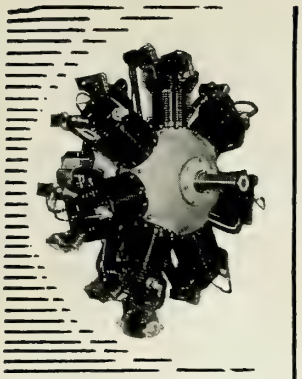


Specifications: Length overall (less starter), 39 inches. Diameter overall, 39 inches. Mounting bolt diameter, 17¼ inches. Bore, 4¾ inches. Stroke, 6 inches. Displacement, 744.25 cubic inches. Weight dry (less hub and starter), 470 pounds. Fuel consumption, .52 pounds per horsepower per hour. Oil consumption, .017 pounds per horsepower per hour.

The Western L-7 is a seven-cylinder four-cycle air-cooled radial aircraft powerplant developing 130 horsepower at 1,850 revolutions per minute. Compression ratio is 5. Scintilla MN 7-D magneto is standard equipment. Carburetor is Stromberg NAR-7. The lubrication system is of the pressure-and-splash type. There are two valves per cylinder, one C.N.S. intake valve and one C.N.S. exhaust valve Jadson manufactured. The propeller drive is direct. Standard S.A.E. starter mount and air starter is optional.

The pistons are aluminum alloy, Tsungani. There are five piston rings per piston, made by the Perfect Circle company. The cylinder heads are aluminum alloy. The cylinder barrels are nickel steel. The crankcase is aluminum alloy.

The Western L-7 is furnished with carburetor heater, exhaust ring and nose spinner as standard equipment. This engine has the L-head-type of valve mechanism. It is designed with as few parts as possible. All auxiliaries are mounted on the rear of the engine.



An Eye to the Future!

● *See our Exhibit of Warner Scarab 5 and 7 Cylinder Engines at the National Aircraft Show in Detroit April 11th to 19th.*

IN AN industry such as ours where constant change has been the order and the only certainty has been uncertainty, there is always the temptation to do the thing that at the moment appears to be expedient—to take the quick profit and forget the long haul ahead.

But, with an eye single to the future, Warner has been rearing its structure on firmer ground.

For we at Warner know that there is a glorious day ahead for the Aircraft Industry.

When that day dawns, Warner will be in line for the rewards that come to the true pioneer, who builds not for the profits of the moment but for those more enduring assets of customer-good will and product excellence.

Though one of the most conservative engine builders in the entire industry, nevertheless some of the most sensational records have been made by Warner Scarab Engines.

For Warner has time and again demonstrated that it will outperform any power-plant of comparable horsepower rating on the market.

As a result, the painstaking care and skill, the knowledge of design and fabrication that enters into Warner Scarab construction has received recognition by those who buy on the record of past performance and not on mere expectations.

The number of Warner Scarab Engines in the hands of those best qualified to judge is one of the strongest sales presentations Warner has to offer.

WARNER AIRCRAFT CORPORATION
DETROIT, MICHIGAN

WARNER "Scarab" ENGINES

The first requisite of an

airplane engine should be

RELIABILITY

For the past two years the

MENASCO PIRATE

has proved its Reliability

FOR FULL PARTICULARS WRITE

MENASCO MOTORS, INC.

Next Comes

MINIMUM WEIGHT PER HORSEPOWER

NOW

the MENASCO BUCCANEER

Lightest weight approved type engine available in the 140 to 200 h.p. class . . . and without the sacrifice of any of the reliability common to all MENASCO ENGINES.*

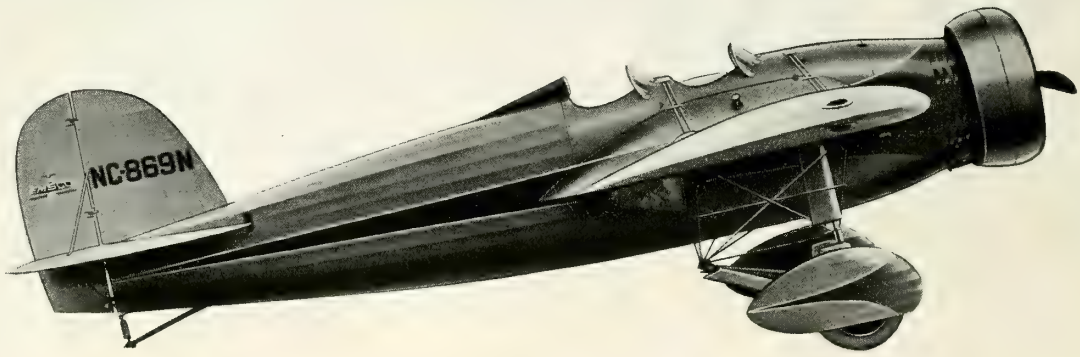
*The Menasco Buccaneer is rated by the Dept. of Commerce 160 h.p. at 1925 r.p.m. and weighs 365 pounds dry. It is already in use by several of the best known airplane builders here and abroad.

6718 McKINLEY AVENUE, LOS ANGELES, CALIF.

ORIGINALITY

- First Midwing in the world to be approved after two years of experimental work

THE EMSCO MIDWING



TWO-PLACE SPORT PLANE

- APPROVED TYPE CERTIFICATE NO. 403
- NOW IN PRODUCTION

WRITE FOR
DETAILED
INFORMATION

EMSCO AIRCRAFT CORP.

OF DESIGN

● Can be converted for express freight service. Holds the world's record for lift per horse power

THE NEW EMSCO HIGHWING



NINE-PLACE CABIN PLANE

APPROVED TYPE CERTIFICATE NO. 400 ●

NOW IN PRODUCTION ●

EMSCO AIRCRAFT CORPORATION

DEALERS' TERRITORY AVAILABLE

DOWNEY, CALIFORNIA

For Sale

5 CURTISS FALCON AIRPLANES

Complete with Night Flying Equipment and Radio

Suitable for Carrying Mail and Express

$5000 Each

Spare Liberty Engine newly overhauled included with each ship



Description

Complete with Liberty engine, Hamilton-Standard propeller, all night flying equipment, instruments, radio receiving set, spare newly overhauled Liberty engine. These airplanes have been completely reconditioned, licensed, and are in daily service on our lines, carrying mail and express. Average time since major overhaul 822 hours; pay load 800 lbs.; capacity, 54.4 cubic feet; Bendix brakes; 36 x 8 tires; cruising speed at 1500 R. P. M., 115 M. P. H.; maximum speed 145 M. P. H.; gasoline capacity 120 gal. main tank; 15 gal. gravity tank; gasoline consumption, 25 gal. per hour. These planes are offered for immediate acceptance subject to prior sale. Demonstration may be arranged at any of the cities listed below.

Equipment

Hamilton-Standard propeller, radio receiving set, all night flying equipment, all instruments: Compass, turn indicator, rate of climb indicator, altimeter, ball bank indicator, air speed indicator, clock, tachometer, thermometer, oil pressure gauge, fuel pressure gauge, Liberty switch with ammeter, full night flying equipment, generator cut out switch, dash and compass lights.

Dept. of Com. License No.	Location
NC-112-E	Kansas City, Mo.
NC-208-E	Cleveland, Ohio
NC-209-E	Chicago, Ill.
NC-210-E	Chicago, Ill.
NC-212-E	Cleveland, Ohio

NATIONAL AIR TRANSPORT, Inc.

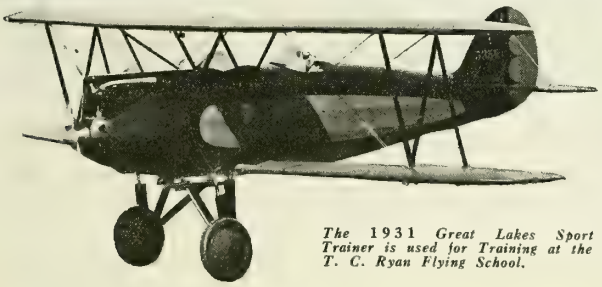
5936 South Cicero Avenue, Chicago, Ill.

Other surplus equipment including engines, propellers, engine parts, etc., is being offered for sale at attractive prices. Write for complete list.

T. CLAUDE RYAN announces

NEW Lower Rates-

for highest Quality Aviation Training



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IN SUNNY SAN DIEGO, CALIFORNIA

EDITORIALS

VITAL DETROIT

WE again are moved to express our admiration of the Detroit aircraft interests, especially the group in that city's board of commerce which has since the early days so enthusiastically and intelligently backed everything pertaining to aviation, including the Ford Air Tour and the annual shows. Detroit has spent over a half-million dollars of its willing and intelligent citizens' money in furthering aviation. More fully than any other city it has earned the right to the support of everybody in the industry. All the space originally provided for this year's show already has been sold and additional is being provided.

These are things to be remembered. At least until some other city indicates that it can do a better, bigger job, we must not let petty jealousies take from Detroit the right to the full backing of the industry in that big annual aeronautical event which now is traditionally hers. If Detroit retains the show, it will always be big and admirably managed.

WHEN WAR COMES IN THE AIR

WE'RE not alarmists. But we are not without our memories. Nor are the Europeans without theirs. There is a difference between the thinking with regard to military aeronautics on the two sides of the ocean. Here we have to stir the people and the Congress up to it; there both parliamentarians and public need to be continually soothed away from too much of it.

Britain suddenly has awakened to the fact that its Labor Government has let it slip to fifth place in the air. Frederick Montague, Under Secretary for Air in the most naval nation that the world ever has known, said recently in the House of Commons:

"The air question is even more urgent than the naval question."

The whole House of Commons favors official stimulation of civil flying in every possible way. Efforts to take the Royal Air Force out of its own control—that is, control by the Air Ministry—and to place it elsewhere recently have failed completely. In the arguments concerning this, Mr. Montague ranked Britain fifth of the great nations in the air, estimating current strength as follows: Britain one per cent lower than in 1925; France 130 to 140 per cent higher; Italy forty per cent higher; the United States 150 to 160 per cent higher.

We are inclined to think that this distinguished Englishman has done us too much honor. But if he was in error we should hasten to make that which he announced the fact and then add to our superiority. He does not compare us with the other nations of the world; he merely compares us with ourselves in 1925. The other picture would be much less flattering.

Flying, he pointed out, has changed London's situation. It used to be quite safe from an immediate attack by any force invading England. Such an enemy would have to fight its way from that point on the coast at which it debarked from its ships. Now an assailing stranger could fly without a pause from his home fields to the point at which he would begin to drop his bombs on Merrie England's capital. London is now fifteen minutes from the coast—instead of hours and probably days and weeks for hostile foreigners.

An effort to turn the Royal Air Force over to the Board of Trade which would utilize it in development of civil flying failed. The Air Ministry will continue to rule it. We are going through similar nonsense on this side, and at this moment still lack similarly admirable centralization.

Many of America's greatest cities are not even fifteen minutes from but actually on the coast: New York, Boston, Philadelphia and others in the East; Portland, Seattle, San Francisco, Los Angeles among those in the West. We have not grown in the air as Mr. Montague believes we have, but we very seriously need to grow by twice and thrice the fine percentage which he attributes to us.

New York and Boston could be struck by air in not much more than a quarter-of-an-hour if the inconceivable should happen (as it often does in this world) and send the blow from Canada. California and other states could be struck with similar speed from Canada or Mexico. All the nation could be struck from the sea with startling swiftness by planes brought overseas on carriers.

Europe is thinking about war (note Montague's remarks, note the endeavor of Germany to re-combine with Austria, note a dozen different things) and to think of war in Europe means to think of air forces, for Europe trembled in the deadly, reasonable fear of air force when air force was an infant by comparison with what it is today and a mere nothing by comparison with what it will be tomorrow and the day after.

FOOLISH TACTICS

DURING the final days of the late Congress it became apparent that some heavier-than-air interests had organized to fight any legislation favorable to lighter-than-air.

Such tactics will not help aviation; on the contrary, they will harm the interests of both dirigible and plane manufacturers. The effort was not a sign of cleverness, but a sign of weakness among those backing it; it was the sort of thing which, if persisted in, will seriously harm its backers.

Lighter-than-air has a big place in aviation and one which heavier-than-air never can fill. The two principles should not be considered rivals; each can and should participate in America's great air development. Selfishness —a destructive, not a constructive quality—won't help build our industry, which many times has been involved in trouble by individuals who could not or did not wish to give the other fellow a fair break. The habit of endeavoring to keep him from getting any of the chestnuts which are roasting is likely to distract one's mind from getting one's own share. Team work in getting all the chestnuts out and then an honest, active, competitive scramble for them after they are safe from danger of going up in smoke would be more sensible.

"THERE are two ways to make a low-priced airplane.

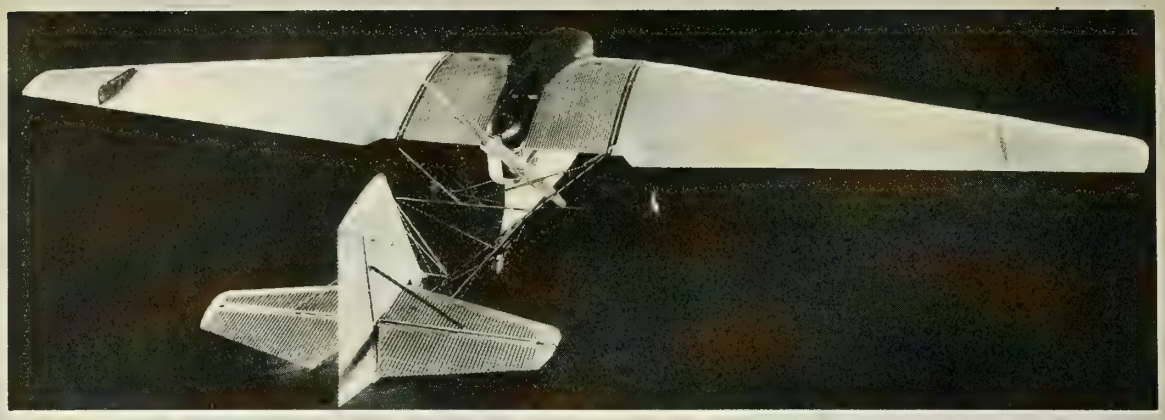
The first is by making a cheap airplane of lowest possible power and permissable performance, shoddy materials and haywire accessories.

The second way is by choosing the plane of the largest possible market, making it in the best possible way, of the best possible materials, and acquiring low price *by the quantity of public demand.*

The Sky Car is the first air vehicle to attempt to enter the last-named field and to present it to the public as a craft that anyone of normal vision and physique can learn to fly within a few hours.

Being a first-year car in its present form, designed for the private owner's safety in his first season of flying-it-himself the plane is not too fast—more attention being paid to slow and accurate landing ability and safety in spite of mistakes."

Bill Stout.



ALL-METAL "SKY CAR" MONOPLANE

THE design of the new Stout "Sky Car" was started by William B. Stout in his engineering laboratory nearly two years ago. The work began with mock-ups or dummies of sticks and wood, in an endeavor to build up an appearance which seemed to comply with the demand of the public before going into the engineering details. At first only Mr. Stout and a wood-worker were concerned in this work, drawings being made in chalk on a blackboard and then tried out, ideas being formulated until the time came to put the plans down on paper. Following this preliminary work, particularly in the attempt to develop the proper type of fuselage for skid landings and adequate protection for the passenger in a crash, a glider was built along the lines projected. This craft was tested at Ford Airport during the summer of 1929. The fuselage structure of this glider was identical with that on the new plane. When these structural and general arrangement experiments were finished, Mr. Stout again laid out the combination of the experiments, and when the final layout was finished, a drafting organization was assembled and the design work begun. The airplane resulting from this work is shown in the accompanying illustrations.

Briefly, the plane is an all-metal, high-wing cabin tandem-seater pusher airplane with a three-wheel landing gear. It is distinctly like a motor car in appearance. It is small in size, weighs less than a thousand pounds and is finished like a fine automobile. The engine being behind, its noise is reduced to that of an automobile traveling at equal speed. There is both a fire wall and a sound-proof wall between the engine and the passengers. Danger of fire is eliminated with the engine in this location. Even the whirr of the propeller is left behind as one speeds along through the air.

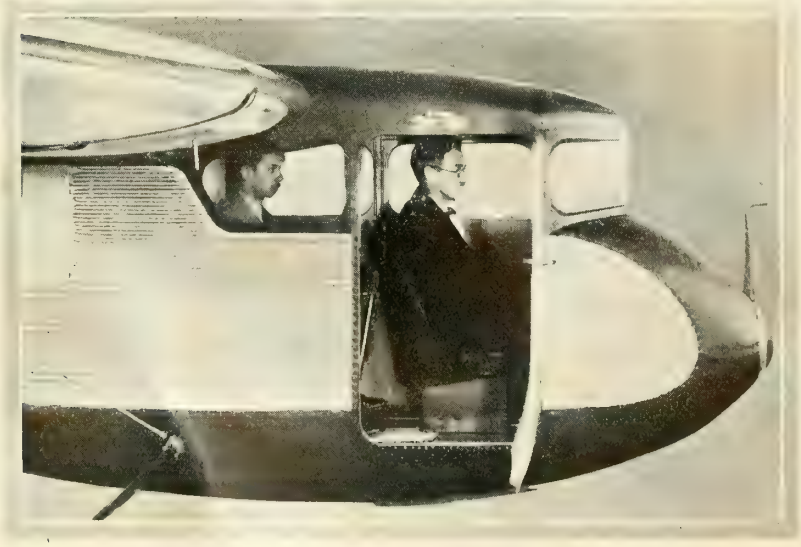
At the nose of the nacelle a leather bumper is streamlined into the front as a means of protection in moving the plane around the hangar, etc. Back of this cushion the metal nose extends up in a streamlined curve and backward over to a V-shaped windshield and below to a rounded bottom extending back towards the rear. Above the windshield, the roof of the plane extends backward in a curve, there being no corners in the design within the passenger space between this curved roof and the bottom of the construction. A keel of reinforced dural, nine inches deep, along the center of the body, acts as a skid in case of an emergency landing away from a good flying field. The flooring is attached on top of this skid, leaving space under the floor for such items as control wires. This also acts as hull space in the amphibion type.

All of the cabin space lies forward of the wings, a feature allowing unobstructed view for the occupants. Tandem seats are arranged with room, without crowding, for the accommodation of two six-footers. A door as used on a two-door sedan automobile is fitted in the side of the cabin, so that one can easily enter either seat from it.

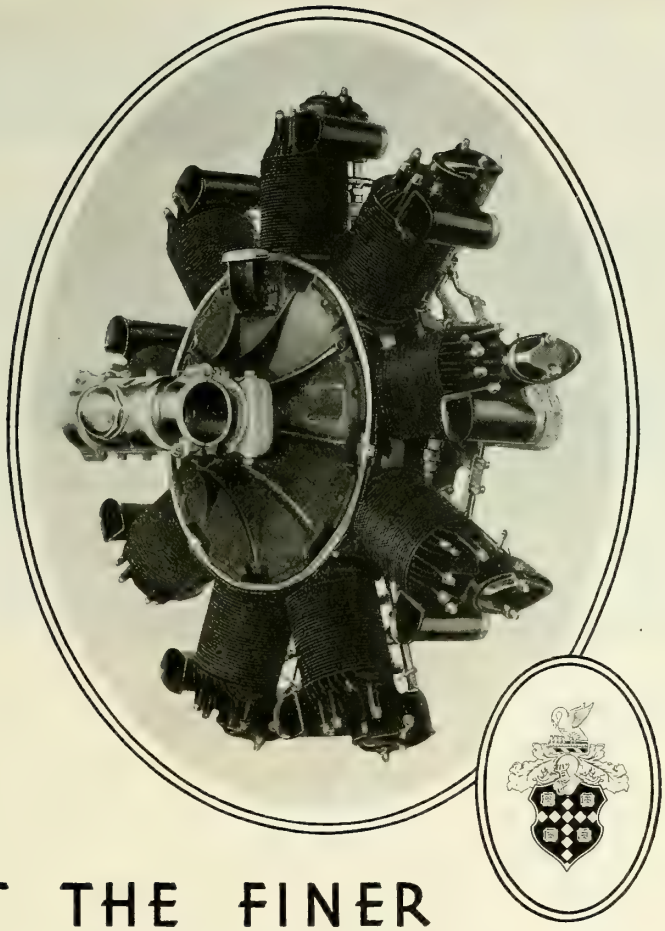
The leading edge of the wing comes just about over the rear passenger in the plane. The cantilever wing extends on either side to a total span of 43 feet. The exceptional span for such a light plane is responsible for its low landing speed. The fact that this wing also has a four-to-one taper from the root to the tip adds much to the delicacy of control and to the stability in gusty air. This feature makes a very easy riding airplane.

Standing on either side of the body and with shock structure down from the main wing spar, a landing gear is formed fitted with low pressure tires and efficient brakes. The wide tread of the landing gear, together with the tapered wing, is responsible for the ease with which the plane can be landed or handled on the ground in side winds. The rear gear is

(*Continued on following page*)



William B. Stout and passenger showing "Sky Car" seating arrangement



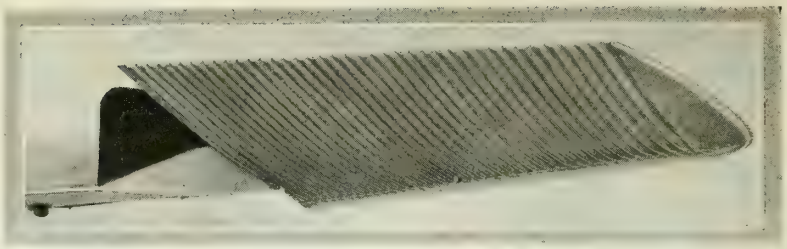
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PACKARD MOTOR CAR COMPANY
DETROIT, MICHIGAN

(*Continued from preceding page*)
set about at the center of gravity of the plane, but is supplemented by two further constructions up forward; under the nose is a skid (or wheel, as desired) arranged so that after landing the plane rests upon three points and at such an angle that there is no lift to the wings. Once the plane is on the ground and down on its wheels there is no danger of a gust of wind picking it up and rolling it over or putting it over on its back. After landing the plane stands in a horizontal position. When the pilot and passenger get out of the plane, however, unless means were provided, the tail would drop down on the ground, leaving the wing at a lifting angle. To take care of this condition a small tail wheel is fitted for a rubber band tension just sufficient to compensate for the weight of the live load so that the tail will still be held in the air and the wings at a no-lift angle when the plane is abandoned on the field. This is an important item, particularly in windy sections of the country.

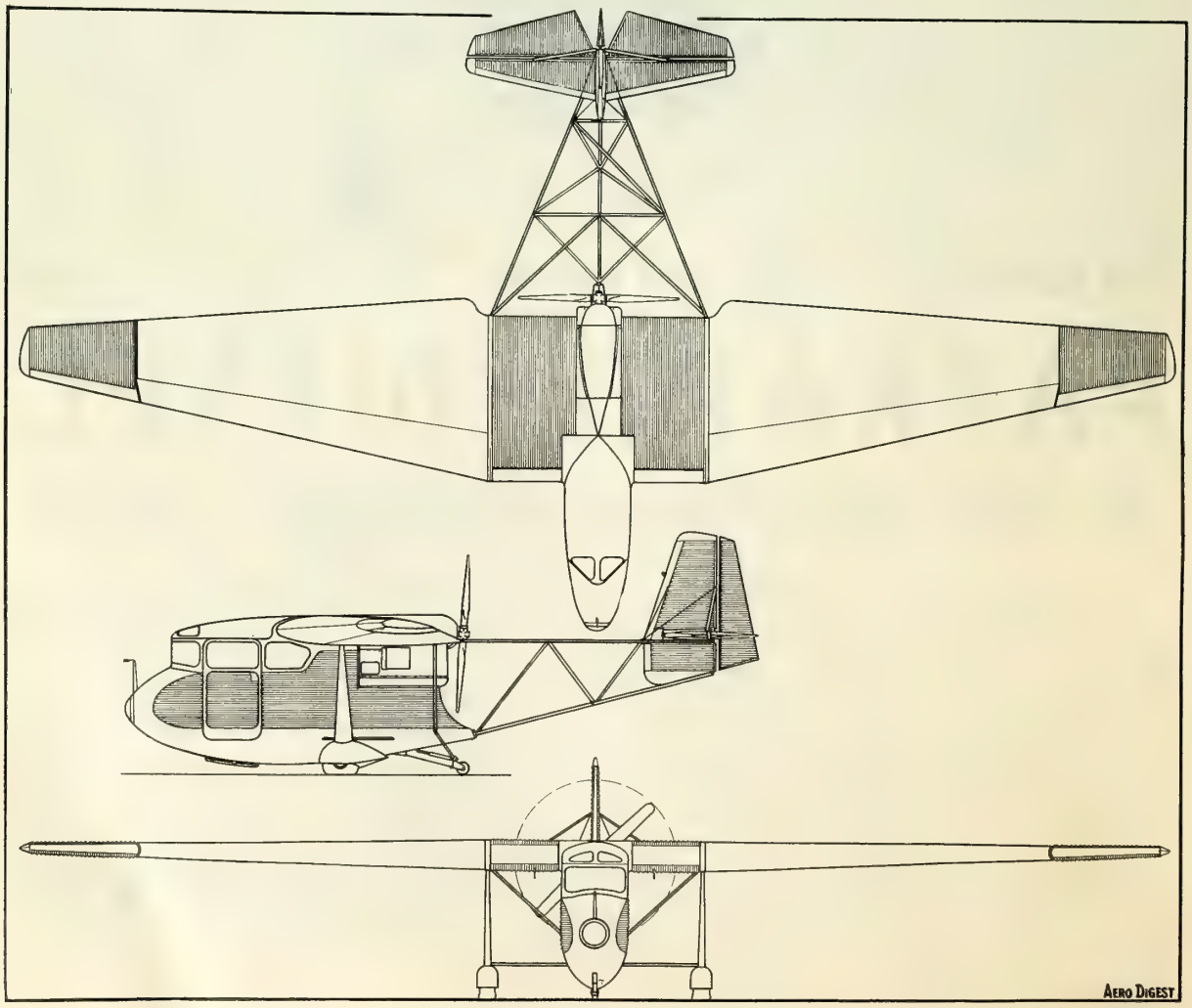
Behind the passenger in the cabin is a solid soundproofed wall extending from roof to floor. An air space behind this wall houses the battery for the starter and some of the accessories of control; behind this a metal fire wall separates the engine from the passenger part of the cabin.



The starboard floating aileron in its raised position

Behind the passenger the fuselage comes to a rather sharp point, this point corresponding with the trailing edge of the wing. The powerplant is located in the fuselage in such a manner that the propeller mounts just behind the right angle junction of the trailing edge of the wing with the vertical sharp trailing edge of the fuselage. The engine is a four-cylinder air-cooled powerplant of the inverted type designed by Mr. Morehouse formerly of Wright Field, and built by the Michigan Aero Engine Company of Lansing, Michigan. It is so arranged in the plane that the cylinder hangs down from the crankcase to fill the rear end of the fuselage. An adjustable scoop on the side conducts air to the cylinders and adequately cares for the cooling of the engine. With this arrangement, cooling is under control. The engine can be warmed up much more quickly than the exposed type and after landing can be

(*Continued on following page*)



Outline scale drawing of the all-metal "Sky Car," two-place light airplane designed by William B. Stout

A new design for a new year . . .

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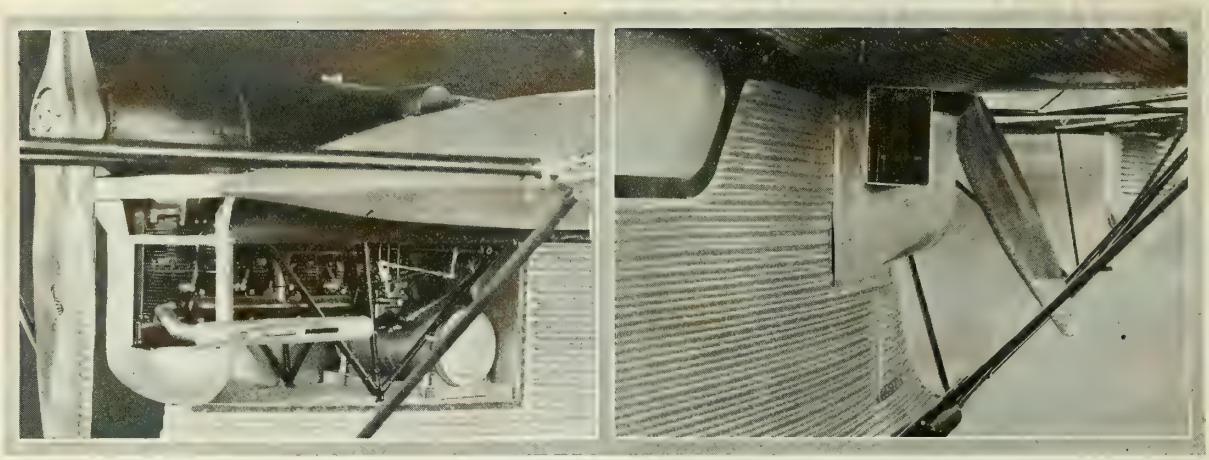
Every improvement that has proved itself has been built into this new, full size, high wing monoplane. No other plane at this price includes all of the Fairchild 22 features of full size . . . licensed for 1,400 pounds . . . top speed of 105 miles an hour . . . 650 feet per minute climb . . . all-metal ailerons . . . all-steel fuselage structure . . . two cockpits 27″ wide and 32″ long with parachute type seats . . . dual control . . . oil hydraulic shock absorbers with eight inch travel . . . low pressure tires . . . brakes . . . stabilizer adjustable from both cockpits. Equipment is complete, including airspeed indicator, altimeter, tachometer, oil pressure and oil temperature gauges, visible gasoline gauge, carburetor choke and carburetor heater control. Four cylinder inline, inverted, air-cooled Rover engine developing 75 h.p. at 1,975 r.p.m. And in addition, ruggedness and flying qualities that have made Fairchild airplanes famous. Continued service assured by the strong financial position of the Fairchild Aviation Corporation.

Fairchild Aviation believes that the private owner and school operator want a full size airplane, with the same performance that they have had for the last two years, at about half the price. Only thorough and experienced engineering of this 1931 design and quantity production make the price possible.

Manufactured by

Kreider-Reisner Aircraft Co., Inc. Hagerstown, Md.

Division of FAIRCHILD AVIATION CORPORATION



Installation of the inverted Rover engine in the stern of the "Sky Car" nacelle

left enclosed to cool off slowly without the necessity of running it a while to prevent warpage of valves. This is a considerable advantage in cool weather operation. The engine is accessible through cowling easily removable on either side of the trailing edge part of the fuselage, making instantly accessible any part of the engine or its equipment.

Back of the wings a triangular outrigger starting beyond the propeller tips on either side from the trailing edge of the wing and from the bottom point of the fuselage runs back to a point in the rudder post of the airplane. This outrigger is constructed of welded steel tubing and is of extreme rigidity. Tail surfaces are constructed entirely of duralumin and are connected to the controls in a conventional manner.

Gasoline is carried in easily removable tanks in the wing on either side, and with gauges in sight. The gasoline feed is carried directly to the engine, with shut-off valves in reach of both pilot and passenger so that either or both tanks may be shut off in case a leak should start in either line.

Forward of the pilot is a complete instrument board containing more instruments than are usually included in a small plane. On the dash is a conventional Ford ignition switch with key. The self-starter button, also Ford type, is of such conventional appearance that one feels quite at home in stepping on the starter, just as though he were starting the engine of his auto. At the pilot's left is a brake lever which he sets in position to hold the plane still while he revs up the motor to the point where the gauges read "ready." This brake is worked by one hand, and one can adjust with great accuracy the pressure on either brake to either prevent or cause a ground loop as desired, or to bring the plane to a quick stop. The throttle is in the conventional position to which controls are fitted for front and rear seats. The stabilizer adjustment is made by turning a knurled button on top of the joy stick. This sets the neutral position of the elevator for trim at any speed and with any load variation, and from there on makes piloting a simple matter, with "hands off" position the usual for fair weather operation. The rudder is worked by foot pedals on the floor similar to the pedals on the automobile, the floor being left clear and sightly.

It is Mr. Stout's contention that any normal, intelligent man or woman with vision good enough to drive a motor car and balance sufficient to walk a straight line should be able to learn to solo this new plane within a maximum of four hours' time and be ready for local cross-country at the end of six to ten hours.

Specifications, Stout Model II Sky Car

Wing Span	43 feet
Length Overall	24 feet
Wing Area (Less ailerons)	168 square feet
Aileron Area	20.5 square feet
Elevator Area	11.3 square feet
Stabilizer Area	10.7 suare feet
Fin Area	11.7 square feet
Rudder Area	6.5 square feet
Weight, empty (With starter and battery)	950 pounds
Useful Load	475 pounds
Gross Weight	1,425 pounds
Power (Rover engine)	75 horsepower
Wing Loading	7.6 pounds per sq. ft.
Power Loading	19 pounds per h.p.
Fuel Capacity	20 gallons
Flying Range	4 hours
Oil Capacity	2.5 gallons



The "Sky Car" in its maximum nosed-forward landing attitude

PRESSURE TESTS ON A MONOPLANE WING

RESULTS of pressure distribution tests on a thick, tapered and twisted monoplane wing model one contained in N.A.C.A. Report 367, by Carl J. Wenzinger. The investigation was conducted for the purpose of obtaining data on the aerodynamic characteristics of the new wing and to provide additional information suitable for use in the design of tapered cantilever wings. The tests included angles of attack up to 90 degrees and were made in the Atmospheric Wind Tunnel of the National Advisory Committee for Aeronautics.

The span loading over the wing was approximately of elliptical shape, which gave rise to relatively small bending moments about the root. The angle of zero lift for all sections along the span varied only within 0.4 degree of the angle of zero lift for the whole wing, resulting in small leading edge loads for the high-speed condition of flight. The results add to the available information for the study of stability at large angles of attack.

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At the Flo School you receive personal, individual instruction and help all the way through your course. The quality of Flo training has attracted as students such prominent men as college professors, presidents and vice-presidents of Corporations and others in addition to ambitious men taking up aviation for their life work. Every flying student receives a complete Transport ground course including aerial navigation, meteorology, aerodynamics, radio, air law, instruments and practical work on airplanes and motors. In addition, Flo students who can qualify have the extra advantage of being able to enroll for long or short aeronautical courses at the University of Michigan.

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DIGEST OF FOREIGN TECHNICAL ARTICLES

By Elsa Gardner

AUTOMATIC CONTROL

Two Systems of Automatic Stabilization (Deux dispositifs de stabilisation automatique). "Aérophile," Vol. 38, No. 1, January 15, 1931, pp. 17-21, 10 figs.

THE Marmonnier system for obtaining stability by means of gyroscopes, and the Constantin wind vanes for automatic stabilization are described in detail. (A description of the design and operation of the Constantin control device, which appeared in L'Aéronautique, was previously abstracted in the October issue of AERO DIGEST.) The Marmonnier control apparatus consists of a group of four gyroscopes which is in the position of stable equilibrium for all three dimensions in space, and is actuated by compressed air. Arrangements for automatic control in two directions instead of three are discussed, two servomotors operated by compressed air being employed. Diagrams illustrate the mechanisms required for maintaining automatic longitudinal stability, automatic lateral and directional stability, and the installation for automatic longitudinal and lateral stability.

Comparative Handling Tests of Three Bristol Fighter Aircraft with Different Types of Slots, C. E. Maitland and J. H. C. Wake. (British) Aeronautical Research Committee—Reports and Memoranda No. 1332 (Ae. 464), October, 1929, 8 pp. and 9 figs.

THE investigation reported was undertaken to determine the comparative handling with three types of slot, namely, the coupled-control, the auto-control, and the coupled-pilot slot. Tests were carried out in normal and stalled flight and the effect of the three types of control on recovery from prolonged spins was taken up. The centers of gravity of the aircraft for most of the tests were 14.4 in. behind the leading edges of the lower main planes, that is approximately on the aft Air Ministry limit. It was concluded that the coupled control slot was the better device except perhaps for checking a prolonged spin.

TIMING RACING PLANES

A System for the Automatic Timing of Aircraft Over a Speed Course, J. K. Hardy, K. V. Wright, and S. B. Gates. (British) Aeronautical Research Institute—Reports and Memoranda No. 1343 (Ae. 475), February, 1930, 9 pp., 9 figs.

A system is described in which the timing counting mechanisms at either end of the course are controlled by a single instrument. A detailed account is given of the apparatus for this system, which was developed for measuring the speeds of racing seaplanes over the three-kilometer course at Calshot during 1929. Two motion picture cameras were used and these, in addition to recording the passage of the aircraft at either end of the course, by a series of photographs, recorded the time at which each exposure was made in terms of vibrations of a tuning fork, which was in electrical connection with counters in both cameras.

The accuracy with which the time of any one transit of the aircraft could be determined was not less than 1/20 second, so that speeds of about 350 miles per hour over three kilometers were measured to the nearest one-half mile per hour. The necessary modifications for further accuracy are briefly discussed and two alternative schemes outlined. A theory of time determination for an apparatus functioning ideally on the principle of the present design is given in the Appendix.

LANDING GEAR STRESSES

Methods of Stressing Divided Undercarriages; H. E. Russell. "Flight" (Aircraft Engineer Supplement), Vol. 22, Nos. 48 and 52, Nov. 28 and Dec. 26, 1930, pp. 84-88 and 89-91, 9 figs.

THE author explains a method for calculating the stresses in a divided undercarriage for an airplane in the first section and in the second gives some practical examples. It is assumed that the undercarriage is stressed by a combination of loads at the tire center; namely, an up load perpendicular to the ground, a backward load parallel to the ground, and a side load perpendicular to the plane containing the up and backward loads.

JAPANESE WIND TUNNELS

The International Wing Model Measured in the Wind Tunnels of Japan. Wind Tunnel Committee Specially Appointed by the Aeronautical Council of Japan. Tokio Imperial University—Aeronautical Research Institute—Report No. 66, Vol. 5, No. 13, December, 1930, pp. 308-440, 12 tables, 54 figs.

THIS investigation is a continuation of the tests of aircraft models in connection with the international model trials in wind tunnels which has been initiated by the National Physical Laboratory, Teddington, England. The object is to compare the aerodynamic characteristics of a wing model measured at as many aerodynamic laboratories as possible in the world. The wing model is of R. A. F. 15 airfoil section. Its exact dimensions, taken at the Aeronautical Research Institute, are given in the text. Measurements were carried out in six wind tunnels: namely, the 2.52-m. and 1.25-m. tunnels at the aeronautical research laboratory of the Imperial Japanese Navy, Kasumigaura, the 1.50-m. tunnel at the Aeronautical Research Institute, the 1.20-m. tunnel at the Technical Department of the Board of Military Air Service, the 2.00-m. tunnel at the Mitsubishi Aircraft Company, Nagoya, and the 2.00-m. tunnel at the Kawanishi Aircraft Company, Kobe. All tunnels are of the open-jet closed-return Göttingen type with the exception of the smaller tunnel of the Navy. All measurements are given with complete descriptions of the tunnels and diagrams of suspension methods, aerodynamic balances and design of the tunnels themselves.

BRITISH WIND TUNNELS

The Design of Wind Tunnels, E. F. Relf. "Aircraft Engineering," Vol. 3, No. 24, February, 1931, pp. 27-28, 34, 8 figs.

GENERAL lines of wind tunnel development in Great Britain are traced from the early days of aerodynamic research to the present time, and extensive model experiments recently made on small wind tunnels in order to develop a return-flow type, are noted. Reasons are given for replacing one of the seven-foot closed-working section wind tunnels at the National Physical Laboratory by two eight-foot tunnels of the open-jet return-flow type, and for selecting the same type for the 24-foot tunnel at the Royal Aeronautical Establishment. In designing the latter, McKinnon Wood adopted the single-return duct form mainly because of its accessibility. Compactness of the return flow type and the enormous saving of power possible with this design are advantages also discussed. The author considers the modern types of return flow wind tunnel more economical, both in cost and maintenance, than the standard National Physical Laboratory type.

ITALIAN WIND TUNNEL

The New High-Speed Wind Tunnel of the Aerodynamic Laboratory of the Ministry of Aeronautics (La nuova galleria aerodinamica ad alta velocità del Laboratorio Aerodinamico del Ministero dell'Aeronautica), A. Eula. "Notiziario Tecnico di Aeronautica," Vol. 6, No. 12, December, 1930, pp. 241-244, 4 figs.

THIS tunnel, although of modest proportions, satisfies sufficiently the needs of the Italian Air Ministry and possesses some interesting characteristics. It is not provided with a return passage, but the return is set up in the air, as it is furnished with joints of an angle designed to set the air in motion with the least possible disturbance. The maximum wind velocity obtained in the tunnel is 80 meters per second, and the power consumed is 470 horsepower.

Paper presented before the Fifth International Congress of Aerial Navigation.

BANKING TESTS

An Investigation of Banking (Untersuchung des Kurvenfluges), H. Kruse. "Zeitschrift für Flugtechnik und Motorluftschiffahrt," Vol. 22, No. 2, January 28, 1931, pp. 37-44, 17 tables, 15 figs.

THE theory of Lachmann regarding non-uniform banking of airplanes was compared with flight measurements and found to agree with them. The calculations of Kann and Salkowski regarding uniform circular flight did not agree so well with the measured values because of the difficulties encountered in flying in a uniform circle.

The tests described proved that the time for reaching a uniform angular velocity was the same for all aileron deflections, and diminished with increasing flying speed, increasing wing dimensions, and, in a very small measure, with the diminishing moment of inertia. It was also found that the angular acceleration could be neglected. The error arising on this account increased with diminishing revolutions and was the same for all aileron deflections. With definite aileron deflection, the angle of roll was the same for all velocities at the end of the angular acceleration.

The variable moment of inertia became more noticeable with small angles of roll and rolling time than in the reverse case, but the effect was so small that it could be neglected. The amount of the moment of

(Continued on following page)



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(*Continued from preceding page*)
inertia had practically no influence on the turning time. The rolling moment increased with aileron deflection and flying speed. The angular velocity was directly proportional to the flying speed, and to the rolling moment coefficient, and inversely proportional to the centripetal gradient. The time for completing the curve was inversely proportional to the aileron deflection and flying speed.

ENGINE RESEARCH

Induction Conditions, Distribution, and Turbulence in Petrol Engines, S. J. Davies. "Engineering," Vol. 130, Nos. 3391 and 3392, Jan. 9 and 16, 1931, pp. 57-60 and 89-91, 7 figs., 7 tables.

RESULTS of an investigation into the connection between inlet velocity and turbulence in a gasoline engine are discussed. Nine sets of special valves were investigated, in addition to normal valves. Slots cut in the shrouds were streamlined so as to change the character of flow as little as possible. The first section of the article ends with a proposed criterion for efficiency of distribution, while the second section takes up the influence of direction of flow and describes full power tests made with single-slot valves of varying port area.

The author suggests that where good fuel economy is all important, it may be profitable to arrange high velocity through inlet ports, assuming regular turbulence is assured by design, even at the expense of higher pumping losses and smaller output. He concludes that, where turbulence is definite in character, the effects of varying the induction temperature are small, but where conditions of turbulence are relatively not favorable, as with normal valves, considerable improvement can be expected from suitable addition of heat.

An editorial referring to this article in the January 9 issue suggests that further research on the size and formation of induction passages, the value of blind extensions into manifolds, and the practice of introducing divisions in manifolds to isolate cylinders into two or more groups, be undertaken by the Institution of Mechanical Engineers and other engineering societies in England.

Paper presented before the Institution of Mechanical Engineers.

AERODYNAMICS

An Experimental Determination of the Intensity of Friction on the Surface of an Aerofoil, A. Fage and V. M. Faulkner. (British) Aeronautical Research Committee—Reports and Memoranda No. 1315 (Ae. 470), April, 1930, 24 pp., 14 figs.

SINCE the velocity changed rapidly near the surface of an airfoil, and the velocity gradient could be predicted reliably only when the velocity observations were taken very close to the surface, three surface tubes of the type designed by Sir Thomas Stanton were employed in this experiment to determine the intensity of the friction on the surface of an airfoil. Observations were found to be mutually compatible and allowed prediction to be made of the velocity gradients at the surface, and so of the frictional intensities.

A check on the general accuracy of these values of frictional intensity was obtained from a comparison of the resultant frictional drag of the airfoil predicted from them with that obtained when the form drag due to the normal pressures on the surface was subtracted from the total drag deduced from the total head losses in tthe wake. It was found that the velocities measured near the surface with these tubes were compatible with those measured still closer to the surface with surface tubes. Frictional drag of the airfoil was also determined from the changes of momentum along the boundary layer.

Smoke Experiments on an Airfoil Without and With a Slot, T. Tanner. (British) Aeronautical Research Committee, Reports and Memoranda No. 1352 (Ae. 483), July, 1930, 2 pp., 24 figs.

THE investigation described was carried out, with the aid of smoke, on the upper surface of the symmetrical airfoil R. A. F. 30, and was a continuation of experiments made by J. J. Green at the Royal College of Science, which illustrated the reversal in the direction of the airflow in the boundary layer behind the point of breakaway in the cases of the circular cylinder and a thick airfoil. The object was to determine whether reversal of flow occurred in the case of an airfoil of normal section, and, if so, to get some idea as to the extent of the region of backflow.

It appeared that a stationary vortex was formed just behind the breakaway of the boundary layer, and that, behind this vortex, others are also formed, but they break off from the surface and travel downstream, forming the eddying wake behind the airfoil.

FLIGHT TESTS

Full Scale Measurements of Lift and Drag on the Blackburn "Iris." L. P. Coombes and R. K. Cushing. (British) Aeronautical Research Committee—Reports and Memoranda No. 1354 (Ae. 485), May, 1929, 5 pp., 5 figs.

THE method described consisted in gliding with engines throttled so that the propellers were running at zero thrust, and in employing a device for indicating when this condition obtains. Experiments were made on the Blackburn "Iris II," and glides at zero thrust and with engines fully throttled were effected. It was found that the differences in lift between gliding with propellers rotating at zero thrust and with engines fully throttled was marked, but the principal effect was observed in the drag measurements. Good agreement with model tests was obtained. The drag of the windmilling propellers was deduced. After further checking with model and full-scale tests, the Committee proposes to use the method for measuring lift and drag of other large seaplanes.

FORCES ON A WING

Determination of the External Forces Acting on a Wing Structure (Détermination des forces extérieures agissant sur le planeur), L. Virmoux. "Technique Aéronautique," Vols. 21 and 22, Nos. 110 and 111, December, 1930 and January, 1931, pp. 294-301 ad 8-20, 8 figs.

THE means employed to determine the external forces acting on the different parts of an airplane in the three principal cases of flight adopted by the C.I.N.A. and S.T.I.Ae., are described. The methods are general and permit the study of other cases of flight recognized as dangerous, as, for example, the passage from diving to inverted flight for aerobatics.

The laboratory tests permitting the application of formulas are the usual tests; namely, the polar of the cellule, polar of the model of the plane, and tests with the wind vane. The calculation of the pitching moments can be made with good approximation and, in certain cases, permit them to be passed by tests with the wind vane.

The author recommends that the angles of the setting of the stabilizer and elevator be measured exactly on the model, that deformation of movable parts under action of the air currents in the tunnel be avoided, and that the position of the center of gravity be marked carefully. He points out that, in order to learn the law of variation of the aerodynamic characteristics of profiles producing lifting surfaces with the greatest possible precision, only theoretical profiles be employed.

STATIC STABILITY

The Static Stability in Flight with a Motored Plane (La stabilité statique dans le vol avec moteur), M. Guibert. "Aéronautique," Vol. 13, No. 140, January, 1931, pp. 11-19, 10 figs.

THE author continues a discussion of the calculation of static stability from previous articles in the magazine, in which he explained how a group of stability curves might be theoretically established giving, with respect to the leading edge, the position of the resultant of the air forces upon the complete airplane in function of the incidence.

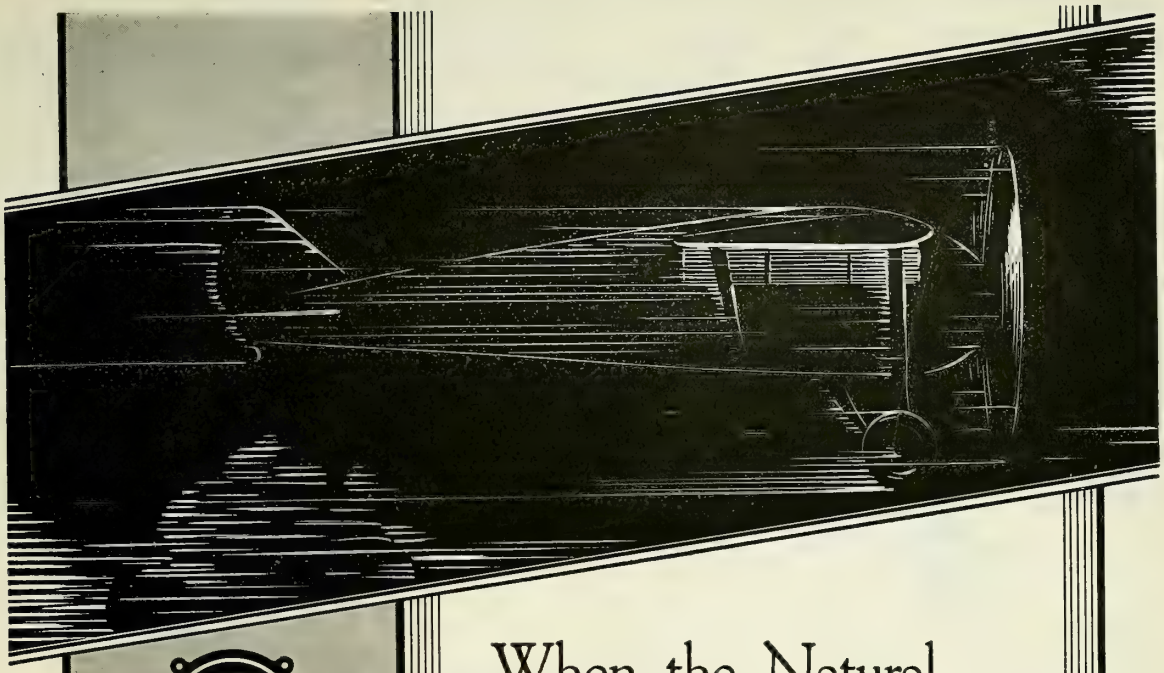
The coefficience of stability in flight with a motored plane is defined as equal to the product of a constant factor, of the algebraic sum of the subtangents (calculated positively for a stable equilibrium), and of the vector taken with its sign representing the product of the ratio of the distance from the line of thrust to the wing chord, to the length of the reference chord, by the inverse of the fineness to the incidence considered. The influence of the operation of the propeller upon the group of stability curves is taken up. A comparison of the stability coefficients of a motored plane and of a glider completes the article.

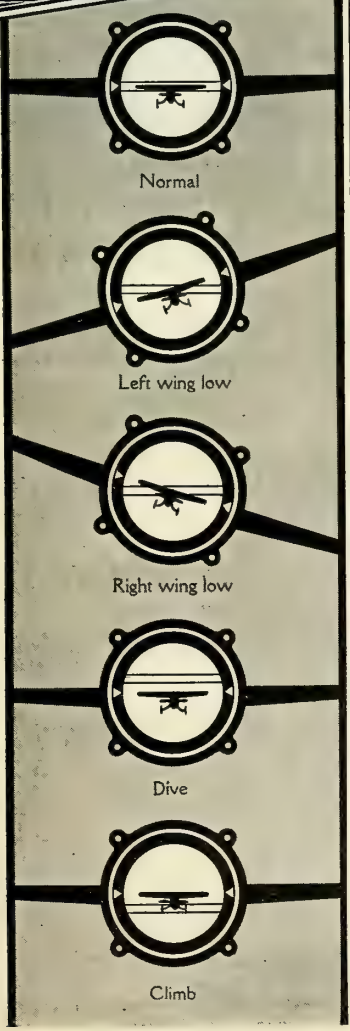
SEAPLANE HULLS

The Calculation of the Bottom of the Metal Hulls for Seaplanes and its Form (Sul calcolo del fondo degli scafi idrovolanti e sulla sua forma), G. Gabrielli. "Notiziario Tecnica di Aeronautica," Vol. 6, No. 12, December, 1930, pp. 205-214, 5 tables, 4 figs.

THE problem of dimensioning the bottom of a metal hull is considered and a procedure for calculating the influence of the keel upon the weight of the structure is described. It is assumed that duralumin plates are used. An example of the appreciable gain in weight found with the keeled hull is given with reference to the differences in behavior of metal and wood hulls. Reasons for adopting the keeled hull from the standpoint of safety are outlined.

In concluding the author explains the advantages of employing a keeled curved hull bottom of concave appearance to obtain the required rigidity without the application of longitudinal stiffening, and remarks upon the convenience of a purely transverse structure with respect to its cross section. Reference is made to the Dornier type of hull.





When the Natural Horizon Disappears

THE airplane has never had an *attitude indicator* for use in flight without exterior visibility. In fog, clouds, or darkness, it was impossible for the pilot to obtain an immediate picture of his wing and fuselage position. Absence of outside reference points rendered the interpretation of instrument readings extremely difficult.

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RECENT AIRCRAFT PATENTS

THE following patents of interest to readers of AERO DIGEST were recently issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N. W., Washington, D. C., at the rate of 20 cents each. State number of patent and name of inventor when ordering:

Aeroplane. Frank Pertesz, Pottstown, Pa. (No. 1,772,396).

Airplane with foldable wings. John J. Wargo, Oyster Bay, N. Y. (No. 1,772,405).

Running light for airplanes. Edward A. Sipp, Chicago, Ill.; assignor to Pyle-National Co., same place. (No. 1,790,251)

Aeroplane wing. Otto L. Kientz, Meriden, Kans. (No. 1,790,309)

Airplane wing stabilizer. Arthur W. Sieglaff, Milwaukee, Wis. (No. 1,790,329)

Propeller with variable pitch. Maurice A. Blain, Pontaneveaux, France. (No. 1,790,532)

Airplane. Carleton W. Fossett, South Barre, Mass. (1,790,658)

Structure of monoplanes with thick wings. Franco Mazzini, Milan, Italy. (1,790,715)

Convertible aircraft inclosure. Julian D. Alexander and Albert W. Mooney, Colorado Springs, Colo. (1,790,785)

Aeroplane propeller. Charles R. Schultz, Menahga, Minn. (1,790,844)

Seaplane. Guiseppe M. Bellanca, Wilmington, Del. (1,790,894)

Aircraft. John W. S. Hodgdon, Long Beach, Calif. (1,790,923)

Aeroplane. Eugene Lalli, Brooklyn, N. Y. (1,790,988)

Safety device for aeroplanes. Piroska Eller, New York, N. Y. (1,791,024)

Propelling device for aircraft. Vincinent Wisniewski, Berlin, Germany. (1,791,079)

Adjustable camber aerofoil. Harry D. Rocheville, Los Angeles, Calif. (1,791,146)

Aero structure. Charles E. Woodruff, Nashville, Tenn. (1,791,182)

Aeroplane wing. Louis Breguet, Paris, France. (1,791,233)

Hydroairplane station. Paul Gerli, New York, N. Y. (1,791,305)

Wing heater for airplanes. Lester W. Stowe, Junction City, Calif. (1,791,331)

Dirigible landing device. William Wiese, Cleveland, Ohio. (1,791,394)

Aircraft. Joseph M. Gwinn, Jr., Buffalo, N. Y., assignor to Consolidated Aircraft Corporation, same place. (1,791,497)

Aeroplane parachute. Antonio Scoyni, New York, N. Y. (1,791,575)

Vertical rising airship. Jesse D. Langdon, Los Angeles, Calif. (1,791,575)

Air-pilot training device and the like. Alvin Bisch, Chicago, Ill. (1,791,655)

Attachment for aeroplanes. Joseph Botka, Jr., Trenton, N. J. (1,791,707)

Amphibian shock absorber. Louis W. Greve, Cleveland, Ohio, assignor to Cleveland Pneumatic Tool Co., same place. (1,791,721)

Aeroplane. Lawson H. Heafner, Jr., Crouse, N. C. (1,791,724)

Hammock support for airships and other craft. William A. Moffett, Charleston, S. C. (1,791,738)

Airplane gun mounting. Carroll W. Chester, Los Angeles, Calif. (1,791,795)

Aerial display apparatus. Oscar Werner, South Bend., Ind., assignor to Rainbow Light, Inc., Long Island City, N. Y. (1,791,857)

Airplane. William Henning, Washington, D. C. (1,791,868)

Parachute for airplanes. Mary L. Little, Long Beach, Calif. (1,791,871)

Launching apparatus for aeroplanes. Donald C. Carver, Cambridge, Ohio. (1,792,000)

Aeroplane. Gerard P. Herrick, New York, N. Y. (1,792,014)

Aircraft body, Archibald Black, Garden City, N. Y. (1,792,480)

Cowl fastener. William J. Irwin, Hempstead, N. Y., assignor to Curtiss Aeroplane & Motor Co. (1,792,537)

Airplane engine stand. Joseph H. Staley, Columbus, Ind. (1,792,612)

Aircraft. Charles S. Hall, Los Angeles, Calif., assignor to Hall Engineering & Aircraft Construction Co. (1,792,738)

Propeller for flying machines. Octive Piampiano, Rochester, N. Y. (1,792,758)

Auxiliary lifting wing for aeroplanes. Henry M. Salisbury, Walnut Grove, and Arthur E. Miller, Sacramento, Calif. (1,792,764)

Aircraft with adustable wing. Philip R. Tarr, Cuyahoga Falls, Ohio. (1,792,779)

Airplane covering material and method of making same. George R. Goin, Detroit, Mich., assignor to Ford Motor Co., Dearborn, Mich. (1,792,829)

Airplane. Edmund B. Cairns, New York, N. Y., assignor to Cairns Development Co., Wilmington, Del. (1,792,890)

Ballast for aircraft. Max B. Pupp, Sonderton, Pa. (1,792,926)

Tail support for airplanes. Joseph L. Cato, Buffalo, N. Y., assignor to G. Elias & Bro., Inc., same place. (1,792,966)

Landing gear. Edmund B. Cairns, New York, N. Y., assignor to Cairns Development Co., Wilmington, Del. (1,793,055)

Folding wing. Edmund B. Cairns, Naugatuck, Conn., assignor to Cairns Development Co., Wilmington, Del. (1,793,056)

Aircraft body. Gordon M. Proudfoot, Chicago, Ill. (1,793,132)

Propeller. Frank G. Sherer, Los Angeles, Calif., assignor to Roberts Bros., Chicago, Ill. (1,793,339)

Airplane. Ivan Anderson, Long Island City, N. Y. (1,793,349)

Aeroplane. Emanuel Cornella, Chicago, Ill. (1,793,387)

Parachute opener. Andred H. Reed, Kansas City, Mo. (1,793,447)

Folding wing aeroplane. John G. Lee, Amityville, N. Y., assignor to Fairchild Airplane Mfg. Corporation, Farmingdale, N. Y. (1,793,494)

Aeroplane. Ole Thorsen, Chicago, Ill. (1,793,651)

Aeroplane propeller. Wallace R. Turnbull, Rothesay, N. B., Canada. (1,793,652)

Variable pitch propeller. Wallace R. Turnbull, Garden City, N. Y. (1,793,653)

Air propeller. Wallace R. Turnbull, Garden City, N. Y. (1,793,654)

Aeroplane landing light. Earl Van Horn, Huntington Park, Calif. (1,793,656)

Aeroplane supporting surface. Joseph Ksoll, Breslau, Germany. (1,793,702)

Airplane landing field and remote control means therefor. Yosmite Nabona and William B. Chapman, El Paso County, Colo. (1,793,744)

Metal tipping for propellers. Frederick Charavay, Piqua, Ohio. (1,793,775)

Gasoline releasing device for aeroplanes. Thomas M. Condon, Valley City, N. Dak. (1,793,777)

Aeroplane. Hannibal H. Fick, McCausland, Iowa. (1,793,788)

Aeroplane safety appliance. Charles H. Rolker, Los Angeles, Calif. (1,793,870)

Supercharger structure. Walter K. Burgess, Santa Monica, Calif. (1,793,903)

Combined aeroplane helicopter. Aldo Curioni, Larchmont, N. Y. (1,793,909)

Propeller and engine arrangement for aircraft. Edward L. Hoffman, Fort Slocum, N. Y. (1,793,933)

Airplane tail jack and dolly. Willis R. McLendon and Martin F. Wagner, San Diego, Calif. (1,794,027)

Airship. Nathan C. Pickard, Denver, Colo. (1,794,202)

Lifting propeller. James M. Bunn, Southington, Conn. (1,794,277)

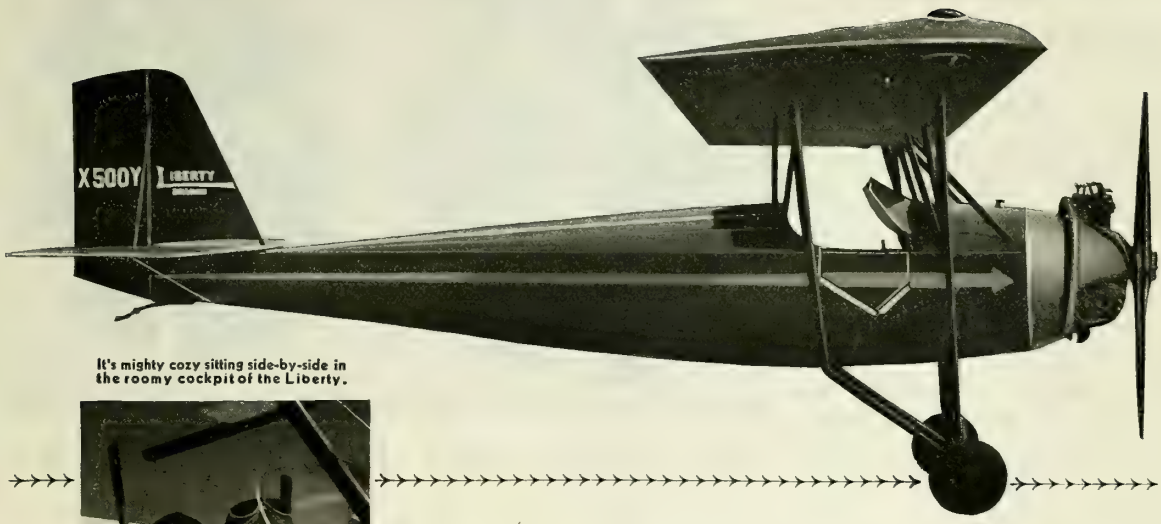
FLIGHT TESTS WITH VARIOUS SUPERCHARGERS

SINCE there are now several types of superchargers in service, information on the comparative performance obtained with each type would be of value in the selection of a supercharger to meet definite service requirements. As a part of the program to obtain this information, the National Advisory Committee for Aeronautics conducted tests, using a modified DH-4M2 airplane with a turbocentrifugal and with a Roots type supercharger. The rate of climb and the high speed in level flight of the airplane were obtained for each supercharger from sea level to the ceiling. The unsupercharger performance with each supercharger mounted in place was also determined.

The results of these tests, as presented in N.A.C.A. Report 355 by Oscar W. Schey and Alfred W. Young, show that the ceiling and rate of climb obtained were nearly the same for each supercharger, but that the high speed obtained with the turbocentrifugal was better than that obtained with the Roots. The high-speed performance at 21,000 feet was 122 and 142 miles per hour for the Roots and turbocentrifugal, respectively.

Report 355 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington. D. C.

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Just a glance at her graceful lines will tell you she's a thoroughbred—all airplane, from tail-skid to prop. Pilots who know their revs call her a performing fool. She's off in 6½ seconds. A minute later, her altimeter reads 750 feet. She cruises a good 400 miles at 78 miles per hour, or steps out at 90 when you give her full gun. She sets down at 28 miles per hour and rolls to a full stop within 50 yards. A sweet little ship to handle, with plenty of what it takes to keep maintenance down among the wee fractions. Write for the name of the nearest Liberty dealer who can arrange to show you what outstanding airplane performance really means.

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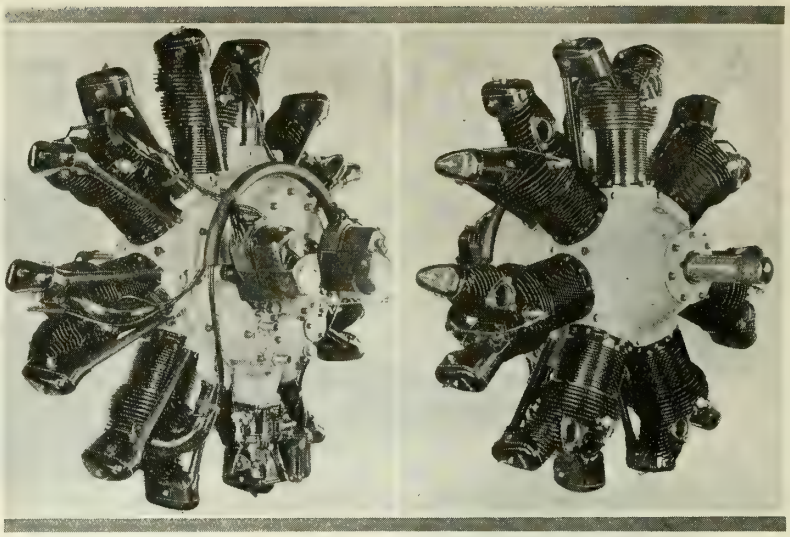
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CURTISS-WRIGHT CHALLENGER RATES 185 H. P.

ON page 70 of the March issue of AERO DIGEST a brief description was given of the 1931 Curtiss-Wright "Challenger" engine. The power output was mentioned as 170 h.p. but the company reports that the horsepower is actually 185. Through an error in the caption, illustrations accompanying the article showed the 7-cylinder Continental engine and not the Curtiss-Wright. To correct this error, both engines are illustrated on this page together with their proper designations. It will be seen at once that there is no resemblance between the Continental and the Curtiss-Wright Challenger, the latter having only 6 cylinders and a double-throw crankshaft which requires that the cylinders be staggered on the crankcase.

The cylinder heads of the Challenger are cast of heat treated aluminum alloy and are screwed and shrunk onto forged steel barrels. The rocker boxes are cast integral with the cylinder heads. The crankcase is cast into two parts, split on the center line of the front row of cylinders. Each cylinder has two Silichrome valves, seating on bronze inserts. The crankshaft is counter balanced, with two master rods each fitted with two short "H" section link rods. Nickel alloy steel is used for all gears, bolts, nuts, studs, crankshaft, connecting rods and piston pins. The pistons are of ribbed type aluminum alloy.

The carburetor is exhaust jacketed around the barrels, using a hot-spot elbow fitted with a valve to control amount of exhaust heat admitted to the carburetor.



CONTINENTAL A70 ENGINE OF 165 H.P.

DEVELOPMENT of Second Series A70 Continental aircraft engine, an improved model of the original Continental A70 powerplant, was recently announced by the Continental Aircraft Engine Company, Detroit, Mich. The new engine is rated 165 horsepower at 2,000 revolutions per minute, the horsepower rating of the original model.

A saving of ten per cent in weight in the Second Series A70 engine is made possible by a newly designed crankcase and accessory case. The accessory case has been shortened 3-7/16 inches: the old-style cross shaft with its spiral gear drive has been eliminated and replaced by straight spur tooth drives for oil and fuel pumps. The long intake pipe which formerly carried the carburetor and connected to the manifold cast in the crankcase has been eliminated. Manifolding in the case has been extended to the bottom where it terminates in a small riser to which the carburetor is attached.

The crankshaft is made in two pieces and forged from chrome nickel steel. The shaft is machined to accommodate a No. 20 S.A.E. splined propeller hub.

A new ring type exhaust manifold has its outlet on the right-hand side of the engine where the propeller wash carries the exhaust gases away from the fuselage of the plane in which the engine is installed.

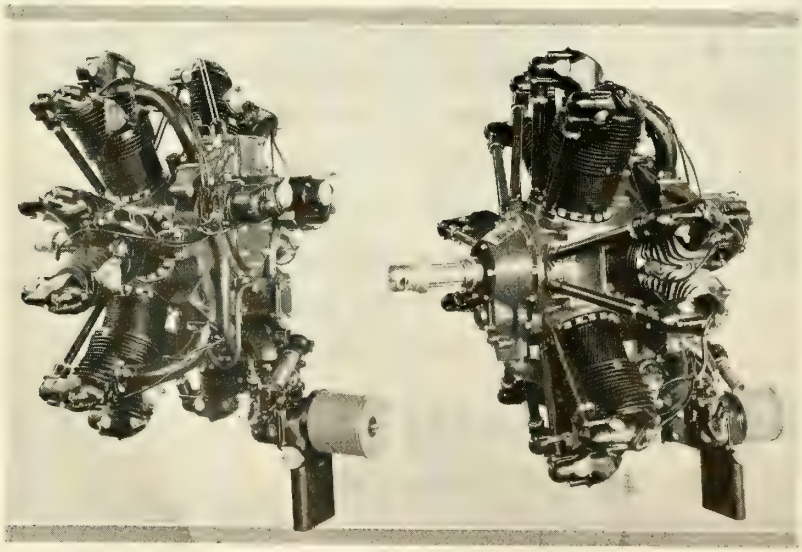
Exhaust valves are of C.N.S. steel and the intake valves are of tungsten steel. Valves are operated by roller type rocker arms with valve adjustment on the rear end. Push rods are light steel tubes with hardened steel ends welded in place.

Standard S.A.E. mountings are provided on the accessory case for two magnetos, starter, generator and fuel pump. A double tachometer drive is operated from the rear of the crankshaft. The engine starter shaft is provided with a three-jaw clutch for inertia or electric type of starter, and an internal spline for compressor drive when air starter is used. Starter, generator and fuel pump are supplied only on special order.

Cylinder assemblies consist of an aluminum alloy head screwed and shrunk on a forged steel barrel. Cooling fins are cast on the cylinder head and turned on the steel barrel. A quick-detachable, lever-lock rocker box cover is provided.

The lubrication system is maintained by a two-stage feed and scavenging oil pump.

Dry weight, including magnetos and carburetor, is 390 pounds, or 2⅓ pounds per horsepower. Weight with standard equipment, including exhaust manifold, is approximately 415 pounds. Bore and stroke of the Second Series A70 is the same as on the original A70 design, 4⅝ inches respectively, which correspond to a piston displacement of 544 cubic inches.



The 1931 model of the six-cylinder Curtiss Challenger 185 horsepower engine

THE NORTON HI-SWING MACHINE—

an answer to the problem of securing a grinding machine with swing sufficient to accommodate CRANKSHAFTS FOR RADIAL MOTORS.

A rugged, powerful machine with excess capacity where needed. 23″ swing—30″ wheels. Crank holders for headstock and footstock allow crankpins to be ground.

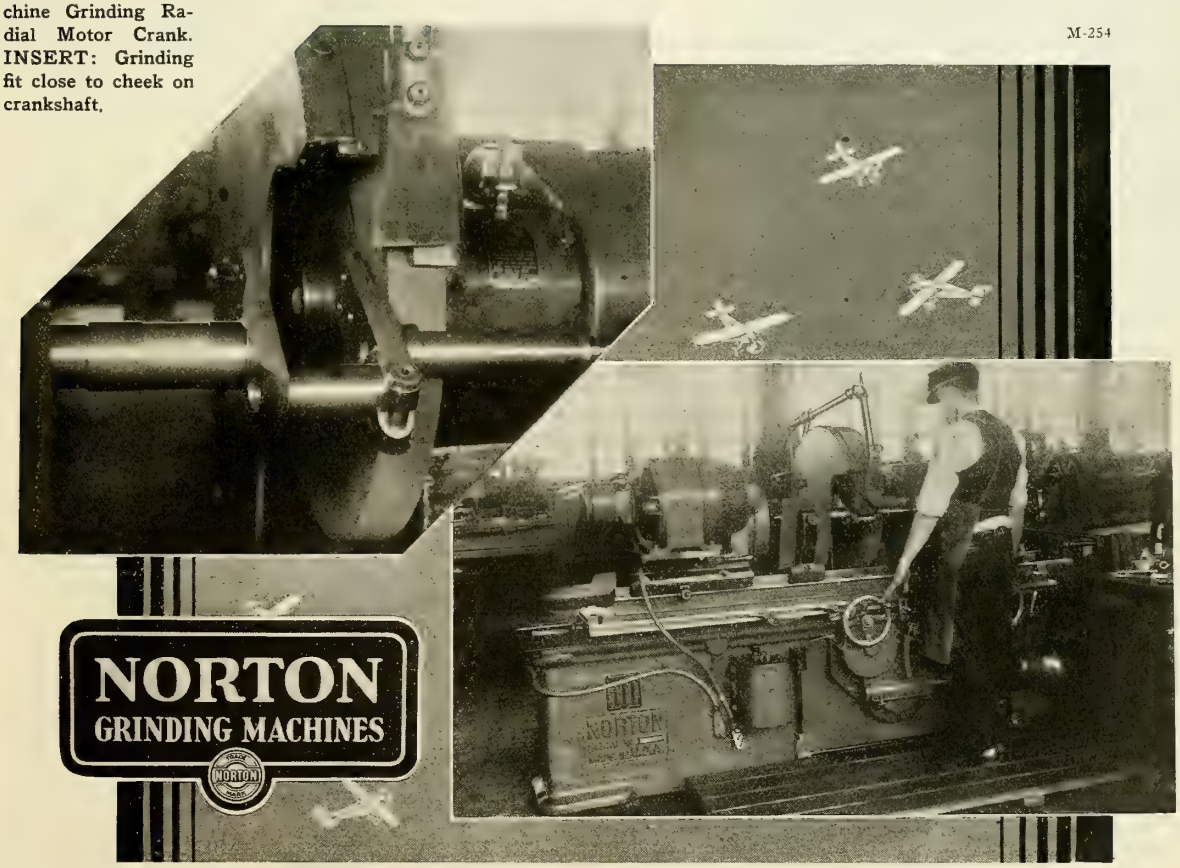
Swivel table provides for grinding tapers.

COMPLETE SPECIFICATIONS ON REQUEST

NORTON COMPANY, WORCESTER, MASS.
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23″ High Swing Machine Grinding Radial Motor Crank. INSERT: Grinding fit close to cheek on crankshaft.

M-254



OUR READERS AIR THEIR VIEWS

Ralph W. Cram comments on a new and different sort of altitude record established by Corn Belt aviator:

"How about the F. A. I. awarding the legal altitude record to Aviator William W. McBoyle, who reached the United States Supreme Court just in time to get a pat on the back by Justice Holmes in the first decision that grand old gentleman made after celebrating his 90th birthday?

"Perhaps you noticed it. Out here in the Corn Belt it created quite a sensation, for we all know Bill, and the fact that he got as far as the Supreme Court suggests that the flying business out of Galena must be good.

"Someone alleged that Bill flew a stolen airplane from Ottawa, Ill., to Buymon, Oklahoma. Now it seems that Congress made it quite a crime, by adopting the Motor Vehicle Theft Act back in 1919, if anyone knowingly drove a 'motor vehicle' from one state to another. Bill seems to have had a good lawyer who was confident that an airplane is not a motor vehicle, and that he could pry Bill loose if he went as high as the Supreme Court to do it. That's what happened, for Justice Holmes rules that we are all entitled to fairer warning about flying stolen planes around than is contained in an act that prescribes penalties for careless handling of 'motor vehicles'.

"Over in Galena, we can imagine Bill telling the boys that Soucek may have pushed his Apache up to 43,166 feet, but he never got as high as the United States Supreme Court."

Fowler W. Barker forwards a letter from Lieut. Col. Fred T. Cruse, F.A., Military Attaché in Costa Rica, who "fills in some gaps" in the record of Western air pioneers:

"I have just read your article in AERO DIGEST for February about air pioneers of the West. It is most interesting, and I congratulate you particularly on having gotten so many of the old photographs.

"You mention the race between Barney Oldfield and Lincoln Beachey at the Emeryville track in 1910. Besides Beachey there were no other fliers present except Frank Johnson and myself. Johnson was a wealthy San Franciscan who a few months before had bought a Curtiss plane, which we learned to fly on the beach at Alameda. For several weeks Johnson had a small circus tent as a hangar near the beach and gave exhibitions whenever the wind permitted. The tent was labelled 'Johnson, The Birdman'.

"You also mention in 1911 an Englishman who did some expert flying with a Blériot monoplane at Tanforan. This was Earle Ovington. Paulhan was the first man who ever flew on this field, which was just the center oval of a race track, and was very dangerous because of the fact that it was completely surrounded by high Eucalyptus trees.

"In 1911 one of the first real aviation meets was held in Los Angeles. Practically everyone you mention was there and also Harry Harkness, another rich San Franciscan, who was flying an Antoinette monoplane with a sixteen-cylinder Antoinette engine. Claude Grahame-White was also there with one of the first of the Rolls planes.

"During most of the time you mention I was a Lieutenant stationed at the Presidio, and since we frequently camped near Santa Clara College, I knew Father Montgomery very well. He several times demonstrated his ideas on aerodynamics, which I find are not very far off even now."

Hugh R. Perry, Waco's sales manager, contributes some timely comment on the why and wherefore of his company's success in the export field:

"Our export activity centers more largely on making the oversea user satisfied in the first place rather than keeping him satisfied after the airplane reaches him. If we start the man off right, then a normally good product such as our own will automatically keep him in a satisfactory frame of mind.

"Except for the most casual catalogue inquiry, we do not use a form letter at any time in our export correspondence. Any inquiry that we feel to be at all legitimate is given the most careful consideration. The country in which the airplane is to be used is studied, and the handicaps under which it will have to function are given careful consideration. Any technical inquiry that the man may make is answered with the assumption that he knows little or nothing of airplanes in general and absolutely nothing of our product, and we attempt to word our letter in such a manner that, if he is a man of considerable experience, he will appreciate that we have no method of knowing this and that our suggestions are offered only to be helpful and not to arouse a feeling of superior knowledge.

"Ofttimes when an inquiry concerns some specific model of our product we advise against the purchase of that particular airplane, knowing well that it will not give the performance that the prospect expects under the conditions with which he must cope. We explain why and offer something that we feel will meet his requirements and elaborate as fully as possible in the most straightforward manner we can why we would prefer not to sell him the item that we believe to be unsuitable for his needs. There is no question in our mind that an attitude of this sort begets the prospect's confidence and he realizes that our interest goes beyond the day when we receive the funds from his letter of credit. This, of course, is particularly true if we recommend a less expensive model than the one he is particularly interested in, which is often the case, for many of our foreign inquiries develop first over the Taper Wing which is the highest priced product we make and, in many instances, the least desirable for the man's needs.

"When the order is received it is filled within the time that we have originally specified. We are extremely careful in quoting delivery dates to allow ourselves ample time to produce anything on which we quote and we have invariably made shipment in exact accordance with our promise. This item builds up further confidence in the prospect's mind and in further sales he, in turn, goes to his prospect confident that any delivery date we offer will be fulfilled.

"The engine manufacturer is advised of the sale and asked to communicate directly with the customer, making suggestions for necessary adjustments to meet his local climatic conditions. Our sources of supply on motors are particularly good in working with us on this phase and they in turn indicate by their prompt correspondence with the prospect before he receives his airplane that they are vitally interested in its successful operation in his hands."

A "Model T" for aviation is J. T. Cox's conception of the salvation of the industry:

"I note in a recent issue that you are dedicating a portion of your magazine to the views and ideas of its readers. I now and then have ideas pertaining to the science of aeronautics and offer the following:

"Now that safety is making rapid progress a big problem faces the aviation industry—that of cost of construction and maintenance. Henry Ford solved the problem for the auto by his mass production campaign. It remains for someone to solve the new problem the same way for aviation. In no other way will planes be brought within the reach of the ordinary buyer. In the privately owned plane lies the marked success of aviation, though, of course, planes will be used more extensively as time goes on in transport service. However, to make the industry a success the cost must be brought lower. This may be brought about in one type of plane as in the old Model T, although it might better be applied to several of the excellent makes of planes. Some may argue that landing facilities, traffic control systems and the like would not permit the sudden influx of cheap planes. Let some alert manufacturer put a reliable, cheap and safe plane on the market for the common man and see how suddenly the rest of the problems are taken care of.

"To support this type of plane and such a plan, the maintenance costs also must be brought lower. If such a plane *were* available, the prohibitive cost of operation would hinder its sale. It behooves the oil companies to get wise to their future consumers' demands of today and act accordingly."

WHAT!

A Heavy Bomber to do the work of a Pursuit Airplane!

TO use heavy duty bombing aircraft where high speed pursuit type aircraft should be used would be absurd. No modern military air service would even consider such a procedure. It is now generally accepted that the maximum effectiveness of military aircraft can be realized only by designing a special type for each type of military aviation activity. Consequently, there are many different types of military aircraft, each designed for a specific type of activity.

What is true of military aircraft is also true for military aerial cameras. The same instrument cannot effectively serve for high altitude mapping and for aerial observation where oblique aerial photographs are required in rapid succession. As in the case of military aircraft the maximum effectiveness of aerial cameras can be realized only by designing an instrument for each military application of aerial photographs. The camera best suited for one application will not serve for another as the requirements vary.

There is a special Fairchild aerial camera for every military application of aerial photographs. Approximately twenty different types of cameras are included in the Fairchild line. Complete information about any of these cameras will gladly be furnished to responsible military officials.

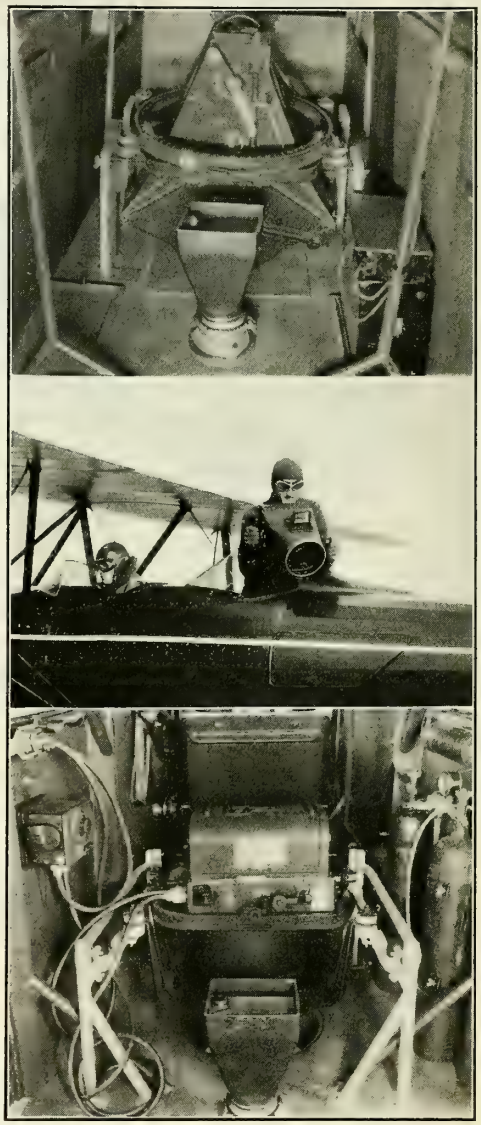
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There is a Fairchild aerial camera for every aerial photographic need—military or commercial. The Fairchild organization has within itself both capable personnel and complete facilities for the development, design and quantity manufacture of all types of special cameras as well as aerial cameras, accessories and aerial photographic laboratory equipment. Contractors to the Aerial Photo Section of the U. S. Army Air Corps, the U. S. Navy, Dept. of National Defense of Canada, Imperial Japanese Army and the air services of most progressive governments.

FAIRCHILD

Aerial *Cameras*



Top—Military aerial mapping must be accomplished with a minimum amount of flying. The Fairchild T-2 is a four-lens aerial camera designed specifically for this purpose. At 15,000 feet a single exposure covers 34.4 square miles and with a single loading of the camera an area of 600.8 square miles can be mapped, allowing for proper overlap.

Center—The F-1 is a special camera for aerial observers—a mechanical eye that has a perfect memory. It is so simple to operate, so ideally suited for aerial observation that it really becomes a part of the observer and is operated without conscious thought or effort. Available with lenses of varying focal lengths and either as recording or non-recording cameras.

Bottom—Automatic and fully recording, this Fairchild K-8 is a marvel of completeness and precision. It can be installed in a fast pursuit plane and operated by the pilot. Available with all lenses from 8 to 24 inches. Above photograph shows a complete military installation including Fairchild view finder and oxygen equipment.

THIS BUSINESS OF RUNNING A FLYING SCHOOL

By I. N. Lawson, Jr.
President, Airtech School of Aviation

Article II:
Equipment, Maintenance, Shop Practice

CAREFUL selection of first class equipment is the primary step toward the success of an aviation school. The next consideration is thorough and exacting maintenance.

In order to get the most efficient results and to keep down the cost of operation, a careful analysis of the situation facing the school is necessary. This study should consider the number of students to be trained, courses to be given, the number of flying hours per day expected of the planes, weather conditions, prospective business, and other factors applying in specific cases and localities.

It has been found at Airtech that the best planes with radial air-cooled engines are most economical in the long run. True, the initial cost of such equipment is greater, but over a period of time engine efficiency, fewer overhauls, a lower rate of depreciation, and other similar factors all combine to reduce the ultimate cost per flying hour.

Careful figuring is required to determine the number of hours a plane can be flown each day with economic efficiency. Too much time without proper maintenance, or too little time, increases the cost of operation out of proportion to the income. Experience has taught officials at Airtech that each ship should fly approximately sixty hours per month, flying six days per week. Regular flying instruction is given on all week-days except Saturday which is devoted to cross-country navigation flights.

Diversification of types of planes is necessary. Primary training at Airtech is given in Warner Scarab Travel Airs and Kinner-powered Fleets. Whirlwind Travel Airs and Ryan Broughams are used for advanced training. A Travel Air and a Fleet equipped with landing and navigation lights are used for night flying. The planes have all necessary instruments for acrobatics and navigation flights.

Flight equipment for all students and instructors at Airtech includes parachutes. The Russell Lobe Parachute is used. All students receive regular practical instruction in the folding, packing, repairing of parachutes, and adjustment of the harness. Advanced students may arrange parachute jumps, but this is not required. Instruction is given by a man who holds a Department of Commerce instructor's license in safety appliances and parachutes. Part of the instruction is a student tour through the Russell Parachute Company factory in San Diego.

Daily maintenance of planes is handled by two groups of mechanics. A chief line mechanic, with the help of one assistant to a plane, does the work in the daytime. Two mechanics, working from 4:00 p.m. until midnight, compose the night shift which carries out all maintenance instructions as ordered by the daily inspection report. The night crew sees that each ship is thoroughly cleaned; the engine sprayed with kerosene; spark plugs cleaned; and gasoline tanks filled. The planes are then made ready for the first flights at eight o'clock the next morning.

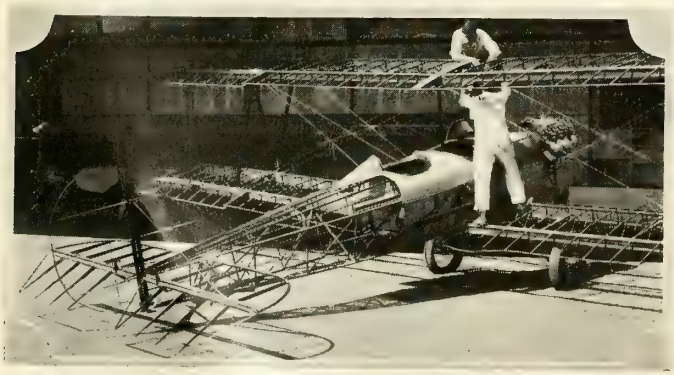
A crew of mechanics works each Sunday washing the planes with castile soap and water, checking magnetos and valve clearances, and doing other required work. Spark plugs are changed after each fifteen hours of flight. Tire pressures are checked and oil is changed after each thirty-eight hours, and after 100 hours propellers are checked as to track. Time for these changes and checkings are observed on a large blackboard in the hangar, whereon is recorded daily the hours of each engine and airplane.

Planes on the line are under the supervision of the chief line mechanic. The planes are kept in a straight line by setting the wheels in a long shallow ditch. A routine is followed when each plane is started. The pilot or student is in the rear cockpit; the mechanic, having blocked the wheels, listens for signals. The pilot calls "switch off," the mechanic repeats, "switch off," and so forth. When the engine is warmed, the mechanic personally gives full throttle and watches the instruments and their actions. He sees that pilot's safety belt is fastened and that his parachute is properly adjusted before the blocks are removed and the plane taxied to the runway.

Maintenance and overhaul are divided into four classes of work at Airtech. They are: line maintenance, engine overhaul, fuselage overhaul, and wing repairing and recovering. Each type is done by the students under the direct supervision of men licensed by the Department of Commerce as approved school instructors in the subjects they teach. This fulfills the essential that students not only learn theory, but also become proficient in the practical application of their learning.

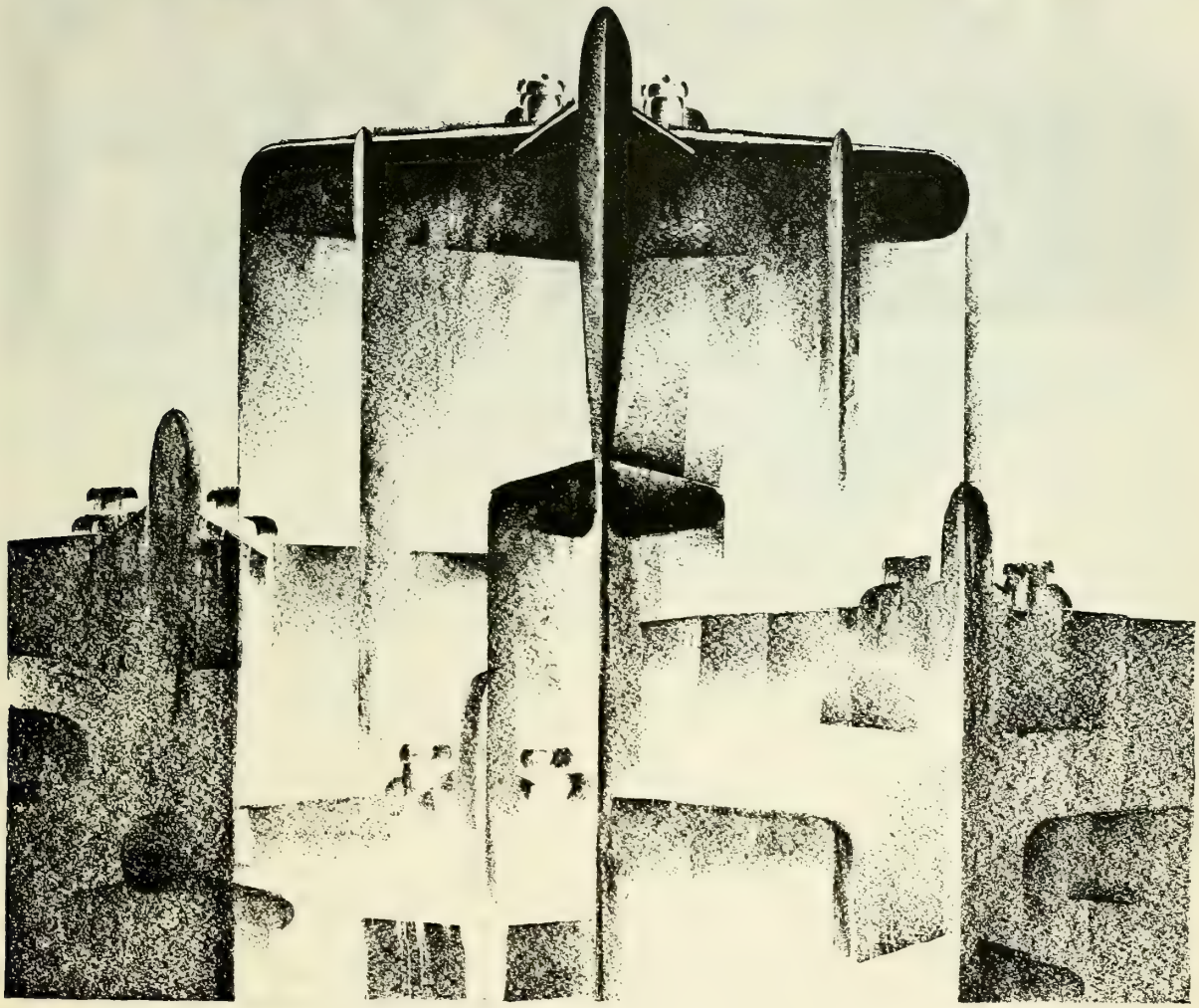
The Airtech engine shop is equipped to handle all the work necessary for overhaul. Not only are

(*Continued on following page*)



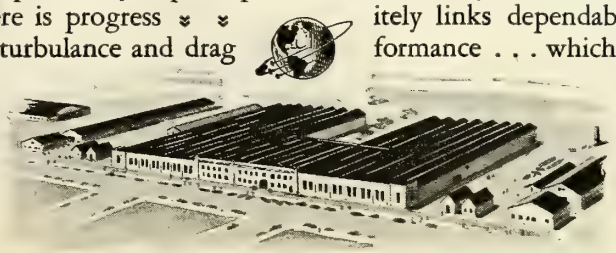
Students overhaul each plane every seven months

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DOUGLAS AIRCRAFT COMPANY, INC. ⁂ *Santa Monica, California*



Under expert supervision, students at work in Airtech shops add practice to classroom theory

(*Continued from page* 182)

radial engines of Airtech planes repaired, but students familiarize themselves with types of water-cooled engines which are kept at hand to be dismantled and rebuilt.

All engines are completely overhauled after approximately 200 hours of service. Each is dismantled and every part cleaned with kerosene and compressed air. The instructor requisitions all needed replacements from the stock room and inspects the cleaned parts. Valves are ground until they pass the gasoline-holding test. After being assembled and properly timed, the engine is tested for compression a minimum of four hours at slow speed and twenty minutes at full throttle. It is then installed on the plane, after which the propeller is mounted and checked. Then it is ready for flight testing.

Overhaul of fuselage and wings of each plane is undertaken about every seven months at Airtech. This is done concurrently with the engine overhaul. The wings go to the wood shop, and the fuselage to the metal shop.

The wings are uncovered and placed on supports for inspection. Cracked ribs are replaced, and the whole structure is trued-up and rigged. All wood-work is given a coat of varnish and then covered. The Grade A fabric is covered with six coats of clear dope with a final finishing of two coats of lacquer.

In the metal shop the fuselage covering is removed and all tubing thoroughly cleaned with emery cloth. A coat of metal primer paint is applied, followed by two coats of aluminum pigmented lacquer. The best of fabric is used to re-cover the fuselage. Six coats of clear dope, and a finishing of two coats of colored lacquer is applied to the cover. Meanwhile the landing gear has been checked and new bushings installed on all fittings. Cowlings are painted and installed. When the job is completed, time cards and material memorandums are made out and forwarded to the accounting department.

A gasoline and oil truck for refueling ships is considered more practical and expeditious at Airtech than an underground fueling system. The tank truck, with a capacity for one day's operations, moves from plane to plane in less time than it would take to taxi ships to a fueling pit.

Other equipment and facilities include a small workshop in the hangar where tools and materials necessary for quick daily maintenance work are kept. A large service truck, built to carry tools and spare parts and equipped with seats for several mechanics or other passengers, also is kept ready for a call from any auxiliary training fields.

Night flying equipment on planes is supplemented on the ground by a large portable 1200-watt floodlight of 2,000,000 candlepower, mounted on a trailer to be placed in accordance with prevailing winds. There also are boundary floodlights and obstruction lights.

Insurance is figured monthly and pro-rated on the overhead. It includes fire insurance carried on all hangars and buildings, office equipment, tools and airplanes while stored in the hangar; passenger and public liability on all airplanes; fire, property damage and public liability on all company cars and trucks; and compensation insurance for all employees.

Depreciation on fixed assets such as hangars, buildings, equipment, machines and tools is based on a ten-year period. It is charged off the books of the school monthly. Depreciation on engines is based on 1,000 hours of flying, and airplane depreciation is spread over a three-year period. These depreciations, figured monthly, as well as a reserve fund which is built up for replacement, also are figured against each flying hour and charged to the hourly cost of operation.



Overhauled engines are tested on mobile stands

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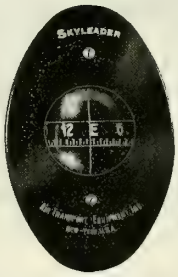
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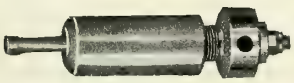
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ECONOMIC AIRPORT OPERATION

By Captain Roy N. Francis

Superintendent, San Francisco Municipal Airport

HAD you been in the reviewing group with General Pershing on February 3, 1920, as the party inspected Kelly Field, you would have seen the world's largest and busiest airport. Imagine a port where 12,000 flights in a day was not unusual—1,000 hours flown by its planes daily! And that was ten years ago.

Consider operating such a field: twenty-four large hangars, a landing area two miles long by a mile and a half wide, hundreds of planes, and the repair and machine shops necessary to keep all those ships running—all this, to say nothing of being responsible for the housing, feeding and discipline of the men.

What factors were considered in the operation of that training field? Were their problems comparable to those of the present-day average airport? Or was that just feverish hangover of war-time activity from which nothing of especial note was learned?

It is quite obvious that the average present-day airport will not be run on a Kelly Field basis; that all the planes on the field will not be "Jennies;" and that the field's shops will not be so large and so specialized that it might be said that the repair work is done in a production manner. On the other hand, it is just as evident that there were certain principles in force at Kelly Field which still apply, and that many of the factors considered in that field's operation merit attention at airports today.

The management of a successful airport begins before the port exists. Many fields are made or broken in their conception alone. Some are built where there is no need and hence, are almost sure to fail. Others are built to fill most necessary requirements, but are so poorly planned and situated that they almost fail entirely to meet the needs which were responsible for their being.

Often in the enthusiasm of being modern, only the motions are made; the thinking, weighing and considering is forgotten. A municipality goes air-minded. Loyal but misdirected citizens rush out to create an airport. Do they stop to tabulate and consider their needs, to decide the best way of meeting them? The chances are that they do not—at least, as they should.

Quite likely they remember that Bill Smith has a pretty level patch of land out north of town on which planes have landed. The land is purchased, and the good citizen who first thought of the idea is made responsible for the creating, establishing and running of the airport. Presto! Another airport is "conceived and dedicated"—probably to be long endured.

Let us examine the procedure which good sense dictates be followed in establishing an airport. Will not the first consideration be the need of the port, comparing requirements with those of other airports and studying how they meet their problems? Then when some knowledge has been gained, will not the next step be to come back home and study the particular problems to be solved there? This done, and the fact having been established that such a project is warranted and necessary, location will then be in order.

The location of an airport should be based on a consideration of the purposes which the port is to serve. The ideal port will be located close to the city and will have, or be adjacent to, adequate transportation facilities so that the field will be convenient and handy. But because cities came before airports, such location will not always be possible, for the site must be large enough to take care of present and future needs and the terrain must be favorable to airport use and construction. And quite likely there will also have to be considered weather conditions, wind, air currents, fog, smoke and haze.

Too much stress cannot be given the importance of solving these problems in the best manner and starting the airport with all the natural assets possible. Why start an airport with handicaps if it is possible to avoid them—handicaps which its management will be forced to overcome at expense and effort, or perhaps to contend with permanently?

Doubtless the next thought, if it has not already been the first one, is financing. This is distinctly outside the realm of the airport management, but the use to which funds are put in constructing and equipping the airport is a responsibility of the management. Much of the future success of the port depends upon how the available money is spent. Especially is this true if the project is municipal.

Everyone likes to feel that full value has been received for any money spent. The degree of success attained in using the funds to best advantage and showing that they have been invested wisely will, in a large measure, decide the future success which the port will enjoy. This brings in problems of education, studies in beauty, convenience and service, as well as what construction, structures and equipment will best serve the purpose of the field.

People have not yet, if they ever will, come to realize the needs of a successful airport. Much money must of necessity be spent which brings a return that the outsider does not understand is necessary and important. The airport management, especially if the project is municipal, must take steps to see that this danger is alleviated as much as possible. A campaign of education should at all times be carried on with the purpose of acquainting the public with what the port is trying to do, in that way getting support and cooperation.

Make the airport a pleasant place—not a playground, yet a place of comfort and convenience. Buildings should not be designed for the sole purpose of utility; there should be some thought for good architectural design. Many will appreciate the beauty who will never understand its full value.

The restaurant and the hotel should be centers to encourage patronage and foster a club spirit—friendship. We, this country, have failed fully to appreciate the potentialities of these two concessions. In Europe development along such lines is far in advance of what it is here, and the airport restaurant and hotel are among the most popular of places. Properly handled, they will become centers to which fliers of the present and future will come, meeting to renew friendships and to discuss problems. After all, doesn't the success of any particular airport depend to

a large extent upon those interested in aviation preferring it to some other port?

There is also a feeling of home pride and spirit which should be fostered. Back in the early days at Kelly Field, we did not have the same problem of making the port a center and a meeting place. Nevertheless, we had that feeling of pride so necessary to the success of any project. Our various clubs and societies functioned in a way to create and maintain customs and traditions, to have a consciousness of being. A port achieving such spirit is almost sure to enjoy its full measure of success.

But to attain such ends, the port must also have satisfied tenants, and here is where the management proper comes into the airport picture. The administration must ever be alert to anticipate wants and fill needs, striving to hit a happy medium between trying to please everyone and spending as little as possible in order that the port may, if possible, show a profit.

Much has been written about and a good deal of work has been done toward perfecting systems of runways and drainage. Hangars, shops and lighting equipment have also shared in the work and experiment which has been carried on by numerous manufacturers and large companies. The result is that at present, so far as these things are concerned, experience and equipment are not lacking and it is quite possible to lay out an airport which will give a maximum of service all the year round, and be a credit to its owners and supporters.

It is not the purpose of this article to try to help pick out and decide on equipment for any port. That problem will always have to be decided for the particular airport itself. It is obvious that construction work should be done and equipment purchased always with the thought of getting the best at the lowest cost, fitting in with the general scheme of the port so that the minimum will be wasted through discards and changes. Care will of necessity have to be exercised to attain such ends.

Rather, here just a few of these "sore spots" will be dealt with in an effort to advance an idea or two. For instance, take the matter of the landing field and runways. On this subject there is a maze of varying information and opinion, some good and some of doubtful quality. But the important thing is to see that a system is adopted and developed which will give service at any and all times. How many superintendents stop to consider that, during bad weather, the weather bureaus at their fields broadcast at least once daily the condition of the field? Well, if superintendents do not, there are others who do. It is a most peculiar pilot who wants to land where he thinks there is any chance of bogging down. Here is a good opportunity to advertise; it is a shame to use it adversely. And there is no denying it: a good landing field is a fine business-getter, even without the help of a daily broadcast.

Then there is service, servicing and repair work. The important question in this matter is not how much service shall be given free and who shall give it but that service which is courteous and competent be readily available. If the port can gain remuneration from it, so much the better, but it cannot afford not to have it. It should not be necessary for a pilot to get his shirt dirty unless he wants to when it comes time to change the oil, and he should not have to fiddle around in the grime to see if the oil screen is clean or get his nails all full of grease taking out the

(*Continued on page* 236)



San Francisco's municipal airport in April, 1930, when Air Corps planes gathered for annual maneuvers

WICHITA'S MUNICIPAL AIRPORT

By Edwin W. Pryor

DURING the latter part of 1928, after the Kansas state legislature had passed an act empowering the park boards of municipalities the size of Wichita to purchase and control land for airports outside city limits, 640 acres of prairie land known as the California section, just outside Wichita, was bought at $100 an acre. Many aviation authorities believe the tract to be one of the outstanding pieces of ground in the country for airport purposes. It is a mile square and of such size and condition that the principal landing strips are 4,800 feet in length. The tract is surrounded by open country where forced landings can be safely made. There are few obstructions close to the field.

The airport is easily accessible from the center of the city. There is an all-weather road to the port, with pavement extending to within one mile of it. There are no grade crossings, trolley lines or other dangerous traffic hazards between the port and the city. At present, it is fifteen minutes' drive from the heart of town, and construction of direct route, now under way, will cut that time to ten minutes.

The terrain of the field is level, and the entire section is covered with a tight growth of virgin prairie sod, excellent for landing purposes. Since it is naturally well-drained, the landing area required a minimum of grading and processing to make the landing strips ready for use.

The major improvement during 1929 was the erection of the large brick and steel hangar, planned with every precaution for safety against wind and fire. The board insisted upon good architecture, and the hangar is as beautiful as it is efficient. This building is of cantilever construction with all supporting columns near the centerline of the hangar, doing away with outside supporting columns or braces.

The building is a side-opening hangar, with rolling doors on both sides arranged so that openings of 230 feet clear span can be made at any time. Dimensions are 102 feet by 272 feet.

At present, the hangar is being used for temporary administration offices, including waiting rooms for airlines, their offices, weather bureau, locker room, etc. The T. & W. A. radio station is also located there. In the other end of the hangar is the electrical control board for field lighting, a field headquarters room where pilots are required to register, a locker room, offices of the Western Air Service, and the N. A. T. offices. Also, the Department of Commerce now maintains a weather service in the municipal hangar, which is serving as administration quarters at present. A total of nine men are employed in the weather service at present, including the radio station.

Most of these offices will be moved into the administration building when it is completed. The shell of the administration building has been completed by the park board, but work is being held up at present pending the location of Transcontinental and Western Air, Inc., headquarters. Wichita, Kansas City and Tulsa are bidding for the operation center of the airline, and the company's decision will greatly affect the administration building here. T. & W. A. plans to operate all its ships from, and do all its service work at, one point somewhere near the middle of its line.

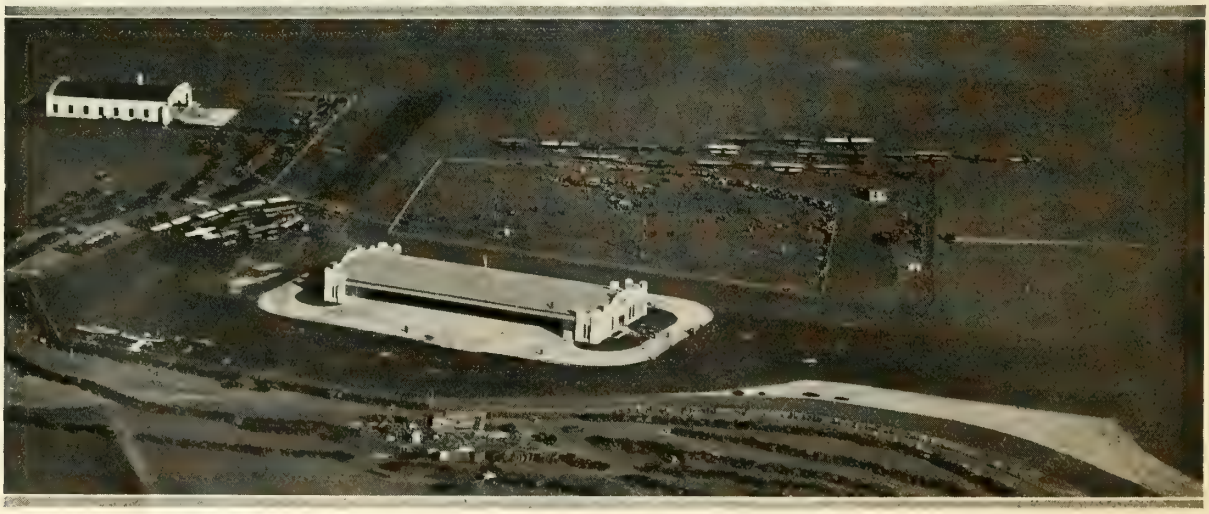
If Wichita is chosen, one or two floors of the administration building will be given over to T. & W. A. Interior work on the building has therefore been halted until the decision is made. The building is outside the entrance parking, to the west of the hangar. It is a beautiful structure, architecturally in harmony with the hangar. The hangar cost $73,000.

The hangar is heated with a blast heater system. The roof is marked with floodlights and obstruction lights, and "Wichita Municipal Airport" in huge letters. It is surrounded by a concrete apron sixty feet wide, doing away with dust discomfort and inconvenience.

The airport lighting installation conforms with Department of Commerce standards for A-1 airports. The installation comprises a system of obstruction lights, field boundary lights, field floodlights, hangar lights, a revolving beacon, an illuminated wind cone, and a ceiling light with ceiling height indicator. The floodlighting equipment consists of two B.B.T. units, one on the east side of the field of 30,000,000 candlepower; the other of 8,000,000 candlepower, near the hangar. Brick buildings house each unit. Boundary and obstruction lights burn all night, and the floodlights are turned on at the conventional signal of flying over the hangar. More than thirty miles of wire and underground cable were used in the system.

The airport is developed as an all-direction landing field. No hard-surface runways are necessary, the surface drainage and turf being excellent on all portions of the field, even after prolonged heavy rains. The most favorable strips are: north-south, 4,800 feet; east-west, 4,800 feet; northeast-southwest, 4,200 feet; southeast-northwest, 3,600 feet.

The boundaries of the entire field have been fenced, and inside the field places reserved for spectators have been enclosed with chain link fence of approved type. In fencing the boundaries, the



Wichita has added good architecture to 640 acres of prairie land to build an airport beautiful and efficient

fences were set in nearly 100 feet, allowing parking room around the entire field for autos. A large area of ground near the hangar has been reserved for spectators. It is a high point and commands for visitors an unobstructed view of all parts of the field.

Other improvements consist of oiled taxi-strips from the landing area to and about the hangar. A fully equipped fire truck and fire fighting equipment is housed in the hangar, ready for instant use.

The administration building, when complete, will house the airport administrative offices. A large space on the ground floor will be devoted to a passenger lobby, air ticket office, waiting rooms and quarters for other services to air passengers. In the building will also be located a restaurant, roof garden, offices for transport and service operators, Weather Bureau headquarters, emergency room, pilot's room, sleeping room and dormitory accommodations, and such other facilities as required by the Department of Commerce for an A-1-A rating. Application for that rating will be filed as soon as the building is completed, and little difficulty in obtaining it is anticipated, for all development work has been done with advice of Department inspectors and chiefs.

In addition to all this, the Wichita park board is making the field one of the beauty spots of the state. Those responsible for this airport development contend that the airport of the future—if not of the present—must be more than just a place where planes may land and take off, undergo repairs, or pick up passengers or cargo. Airports must be attractive and appealing to the public, just as are modern railway terminals. There is no reason why a municipal airport should be an eyesore.

In the northwest corner of the field, an area of about sixty-six acres, unsuitable for landings and take-offs because of a depression, is being landscaped and developed as a park and recreational area. A small lake will be the main feature of the park. Low-growing shrubs, which will not interfere with a forced landing or endanger low-flying planes, have been planted. The rest of the area has been sown to lawn grass, and flower beds, winding paths, comfortable benches and shady nooks have been arranged for.

Climbing roses have been planted on all the airport fences, which entirely surround the 640-acre field, and the grounds adjacent to all the airport buildings will be beautified by landscape treatment.

As a further beauty measure, the field has been zoned for buildings. The region just to the east of the park, which is the first portion of the field to be seen by visiting motorists, is designated as Zone A. In it, only buildings of stone, cement and similar permanent materials may be erected, and the style of architecture must conform to that of the municipal hangar and administration building. The zone is limited to showroom buildings and hangars, such as the one erected by Stearman Aircraft Company. Zone B, farther from this section of the field, is for buildings of not quite so beautiful an appearance. Only in Zone C may sheet metal buildings be erected, or private hangars, accessories shops and service buildings be located. Zone B and C are on the extreme eastern edge of the field.

Stringent rules about keeping floors and buildings clean of oil and drippings are enforced, both as a fire-prevention measure and for the sake of general appearance.

CURRENT AIRPORT and AIRWAY FACTS

IN direct competition with railroad rates and providing frequent service between its terminal cities, the first unit of the Century Airlines was opened on March 23. The first line inaugurated connects Chicago and St. Louis via Springfield; and Chicago, Toledo, and Cleveland. The company plans to increase its operations within 90 days to schedules every hour and to extend its system to cover the entire Middle Western and Southern states.

The new line is being financed and managed by the Cord Group with E. L. Cord as president and L. B. Manning as vice president and general manager. William Bliss is assistant general manager in charge of operations.

The company has placed an order with the Stinson Aircraft Corporation for 100 trimotored ten-passenger planes to be used in this service. Approximately 300 operators, traffic men, mechanics and communication experts will be employed. General headquarters for the company will be in Chicago at the Municipal Airport, where a large new hangar and terminal building is to be erected.

Schedules provide for six planes to connect Chicago and St. Louis via Springfield daily. Nine planes connect Chicago, Toledo and Cleveland daily. All planes between Chicago, Toledo and Cleveland also connect Detroit. Flying time from Cleveland to Toledo is one hour and from Cleveland to Detroit, one hour and 35 minutes, including a five minute stop at Toledo. Flying time from Cleveland to Chicago is two hours and 30 minutes. Detroit to St. Louis is six hours and five minutes.

A ten per cent reduction is given by the company on all round trip tickets and special commutation fares are offered. Traffic has already exceeded expectations; 163 of the 180 available seats were filled the first day.

FOLLOWING a study of air transport operation costs, the Postoffice Department has announced the increase of the number of schedules on the larger and more important routes. Postmaster General Glover states that, as a result of the reduced rates paid to operators, it has become possible to offer more frequent schedules at less expense to the government. Present operators rather than new companies are authorized to operate the new services.

Schedules were announced for April 1 which add 10,750 miles of combined air mail-passenger service, making a total of 85,555 miles of service provided by air mail contractors each 24 hours.

Four large operators concerned in the new schedules are National Air Transport, Transamerican Airlines Corporation, Eastern Air Transport, and Boeing Air Transport.

PLANES of National Air Transport and Boeing Air Transport were scheduled to inaugurate on April 1, the nation's first "day and night" air mail-passenger service between the Atlantic and Pacific seaboards effecting schedules of twenty-eight hours eastbound and thirty-one hours westbound between New York and San Francisco.

According to pre-inauguration announcement, passengers leaving New York at 9 a. m. arrive at San Francisco 2,770 miles away, at 1:18 p. m. the following afternoon. Eastbound, passengers leave San Francisco at noon and arrive in New York at 7:24 p. m. the following evening. The trip eastward is three hours faster than westward due largely to prevailing winds.

National Air Transport flies the New York-Chicago divisions and Boeing Air Transport between Chicago and San Francisco.

Los Angeles, Seattle and other Pacific Coast cities are also brought within a one and one-half business day trip to New York. Denver, in the heart of the Rockies, is only sixteen hours from Broadway. The line serves cities which are trade centers for 40,000,000 people.

ANNOUNCEMENT of a new exclusively passenger air service to be known as the International Air Express, linking Detroit with Brownsville, Texas and the Mexican border in less than 25 hours, as well as offering frequent service to intermediate southwestern cities has been made. The service is to be inaugurated not later than May 1, officials said.

Among the prominent persons identified with the new company are W. B. Mayo, of the Ford Motor Company and L. G. Fritz, formerly vice-president and general manager of S. A. F. E., and Major Lawrence G. King of Detroit.

Pending the issuance of the necessary Federal certificate, tentative plans, according to Major King, now contemplate service using Ford trimotor transport planes from Detroit and Cincinnati to Brownsville by way of St. Louis, Mo.,

(*Continued on following page*)

through Oklahoma via route yet to be determined to Dallas and Fort Worth, Texas and thence to the border.

Completely financed by prominent individuals and interests in the cities along the route, the new company has already placed orders for planes. In addition to Ford tri-motor transports on longer schedules, a fleet of six-passenger Northrop all-metal planes may be placed in service between Muskogee, Okla., and Brownsville, Texas.

At the outset daily service between Brownsville and St. Louis, to arrive in the latter city for connection with fast evening trains in all directions, will be maintained. Other planes will be operated in daily through service between Dallas, Fort Worth, Cincinnati and Detroit. The planes will not carry mail.

UNIFORM traffic control at airports was scheduled for discussion at the Third National Airport Conference of the Aeronautical Chamber of Commerce of America, Inc., held at Tulsa, Oklahoma, March 25 to 27.

The program set aside the first two days of the conference for a study of the outstanding problems in the airport field, including field management, construction, design, lighting, communications, insurance and accounting. Conferences of state commissioners and of airport managers were planned for the third day.

New products for the equipment of airports, including signal systems, radio equipment, lighting systems and fire prevention systems, were scheduled to be demonstrated during the three-day conference.

THROUGH an error an illustration of a hangar in the February issue of AERO DIGEST was miscaptioned as the hangar built by The Austin Company at United Airport, Burbank, California. The hangar shown was that recently built for Boeing Air Transport at Omaha.

The Austin hangar is larger and conforms in design with the Spanish architecture of United Airport. It has unique door installation and is said to be the only type of hangar that can grow indefinitely. The builders of the hangar say that the door openings could be increased from the present 300 feet width to 3,000 or even 30,000 feet without creating a problem in door installation.

ARRANGEMENTS to facilitate making of reservations over airlines has been effected between several air transport companies and the Western Union Telegraph Company. Without charge to the passenger, reservations may be made in Western Union offices in all larger cities, thus overcoming the inconvenience in booking passage that has proven an obstacle in air travel.

The companies now under contract with Western Union for passenger reservation services are: Alaska-Washington Airways, Bowen Air Lines, Colonial Division of American Airways, Dixie Flying Service, Main Flying Service, New York, Philadelphia and Washington Airway Corporation, Pittsburgh Airways, Rapid Air Transport, Wedell-Williams Air Service, Western Air Service, Kohler Aviation Corporation, Robertson Air Lines, Pennsylvania Air Lines, Continental Airways, Chicago Detroit Airways, and Martz Airlines.

A NEW air passenger route was to be opened April 1 along the Atlantic seaboard between Richmond, Va., and Jacksonville, Fla., by Eastern Air Transport, Inc., which was already operating a system of passenger and U. S. air mail services between New York and Miami via Atlanta.

Raleigh, N. C., Florence, S. C., and Savannah, Ga., are ports of call for the transport planes in the new service and on the completion of its field facilities, the city of Charleston, S. C., will also be made a stop. The latter city will probably be ready to receive the service on May 1.

At first one schedule daily will be maintained over the new coastal route. This schedule calls for a plane to leave Jacksonville with passengers in the morning and arrive in New York before dark. Another plane will leave New York in the morning and arrive in Jacksonville before dark.

TRANSAMERICAN AIRLINES CORPORATION, U. S. air mail, passenger and express division of Thompson Aeronautical Corporation, was to inaugurate on April 1 fast through-service between Chicago and Detroit with multi-motored radio-equipped planes, and resume operation of its 55 minute trans-Lake Erie schedule between Detroit and Cleveland.

These new services supplement TAC's present air mail, passenger and express lines serving 17 Mid-Western cities and are the first step toward the establishment of a comprehensive Great Lakes transportation system planned by the company. Multi-motored equipment was ordered for the new lines several weeks ago.

THE Ludington Line, operating hourly air service between New York and Washington, on April 1 was to increase their present 20 schedules to 30 schedules daily.

Extra sections or express flights were scheduled to be added at 8:00 a. m., 3:00 p. m., 4:00 p. m., and 5:00 p. m., with new later departure at 6:00 p. m., from Washington, and 6:45 p. m. from Newark Airport.

The addition of Wilmington as a stop and the extension of the line to White Sulphur and Hot Springs via Charlottesville with one schedule each way daily was announced simultaneously with the increase of schedules.

Two more Stinson tri-motors will be delivered to the Line the first week in April. With these, the Ludington fleet will consist of eleven airplanes.

To date, it has been necessary to operate extra sections on practically all fair days. The new schedules also anticipate increased summer travel.

AIRPLANE service every two hours between New York, Hartford and Boston over American Airways' Colonial Division went into effect on March 2. Six trips are being flown each way daily except Sundays between the three cities. On Sundays two planes each way are operated.

"While the need for additional airplane service has been apparent for some time," F. G. Coburn, president, said, "the decision to put on more schedules was not made until after a careful analysis of the operations of the past two years. During this period 16,249 passengers and 231,558 pounds of mail were flown more than a million miles between these centers.

"It has been the necessary practice of air lines in the past to offer infrequent schedules, which meant passengers must adjust themselves to the service. However, we are reversing that order, believing these new services will permit travelers to go more nearly at their convenience. We hope to offer even more frequent services between New York, Hartford and Boston over our Colonial Division as public convenience justifies."

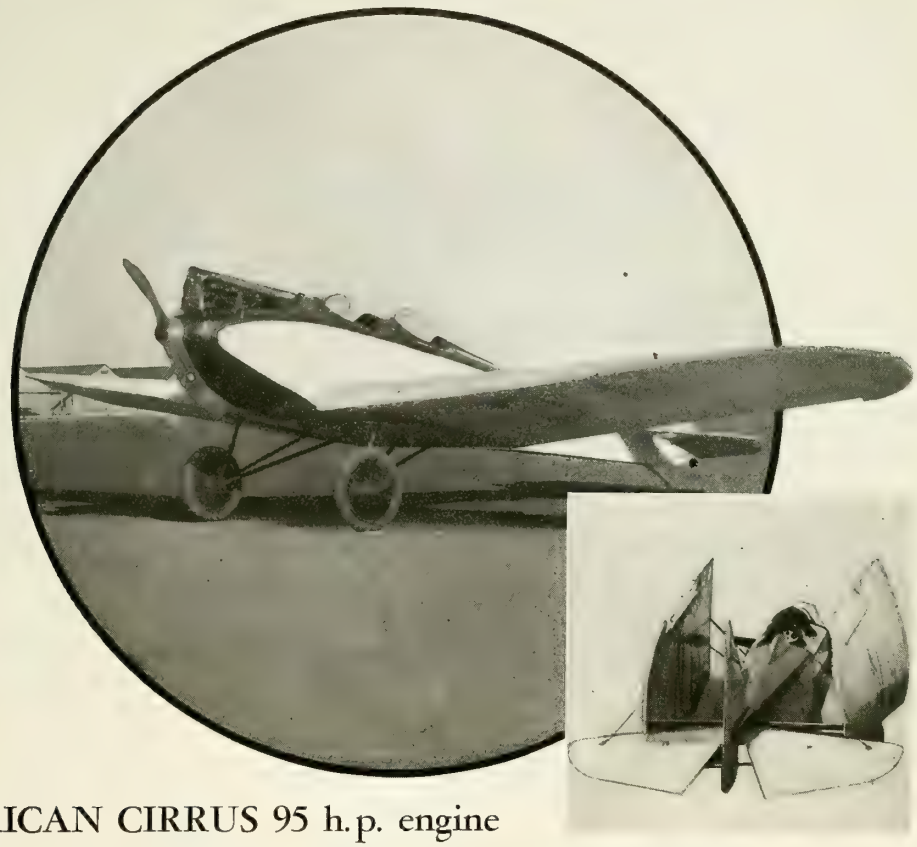
THE Crouse-Hinds Company has developed a new flash marker light for outlining landing circles and runway arms at airports.

This marker light is designed for installation in the ground, with the top surface flush, and is connected to an underground source of power remotely controlled. The body of the marker is made of heavy cast feraloy, and in the door is a piece of moulded glass ⅞-inch thick, seated on plastic cement, thus making the unit water-tight. The case and door are ground to a tight joint and in addition there is a substantial gasket to keep out surface water.

There are two types of this marker light being produced by the company, one of which is equipped with a medium screw base receptacle for use with multiple lamps. The other, which is a larger and deeper unit, is equipped with a spring clip series receptacle for use with 6.6-ampere, 600 or 1,000-lumen lamps in S-24½ bulbs.

A NEON obstruction marker has been mounted forty stories above the street on top of the Cathedral of Learning, a new building of the University of Pittsburgh, Pittsburgh, Pa. The marker, designed by R. E. Marbury of the Westinghouse Electric & Mfg. Co., resembles a spread umbrella with six V-shaped neon tubes sloping down from the center. The covering of the tubes consists of a cone-shaped hood to which a wire screen is attached.

The WESTBROOK SPORTSTER



with AMERICAN CIRRUS 95 h.p. engine
for SAFETY PERFORMANCE APPEARANCE ECONOMY

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FLYAWAY NEW YORK

THE Westbrook Sportster, designed for the owner-pilot, embodies those features of proven merit which enable a plane to be flown safely by the inexperienced pilot. A cantilever non-stalling wing of unusual strength and rigidity, set with a dihedral of 6°, assures maximum safety in the air. A wide track landing gear which moves forward with impact, eliminates landing and taxiing hazards and permits operation from rough fields without danger of nosing over. Through simplicity of design an unusually strong and rigid structure of light weight is obtained, enabling the Westbrook Sportster to withstand rough usage without constant attention.

Finally, RESERVE POWER. This plane has 95 horsepower, but it will fly on 40, thus assuring the ultimate degree of safety and performance. Power makes an airplane fly; too little of it makes a plane safe only for the experienced pilot. Fly the Sportster with the knowledge that you have more than enough power for every emergency. The *unique folding wing feature reduces housing costs* and permits easy transportation of the airplane behind a car or truck.

SPECIFICATIONS

Span	32 ft.
Wing area	148 sq. ft.
Length	23 ft. 6 in.
Width, wings folded	8 ft. 9 in.
Weight, empty	900 lbs.
Weight, full load	1400 lbs.
Seating Capacity	2
High speed	125 m.p.h.
Cruising speed	100 m.p.h.
Landing speed	40 m.p.h.
Rate of climb, light load	1400 ft. per min.
Rate of climb, full load	1100 ft. per min.
Cruising range	400 miles

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THE AIR SERVICES

PROBLEMS TO TEST NAVY AIR FORCE

MAJOR naval concentration in which 227 naval planes and forty-four surface craft of the United States Fleet will engage in three distinct air problems, is being held March 23-31, ranging the entire Caribbean Sea from the Panama Canal to northern limits of the West Indies Islands. The problems will be of "infinite value" in determining both the development of naval aviation under the nearly completed five-year program and the effective fighting force that it provides, according to an announcement of David S. Ingalls, Assistant Secretary of the Navy for Aeronautics.

The exercises will be under the direct supervision of Vice Admiral Arthur L. Willard, Commander Scouting Fleet, and in addition to involving all units of the Scouting Fleet, will include the use of the aircraft carriers *Saratoga* and *Lexington*.

The "sustained offensive and defensive capabilities" of the Navy's air forces will be tested in the maneuvers. The three problems have been arranged so that extended over-water flights from carriers and land bases will be necessary.

In the first problem, two aircraft carrier groups will search for and operate offensively against each other. The second problem will consist of an air attack by an aircraft carrier group against surface craft equipped with a lesser plane operating strength. The third of the air concentration problems will consist of an attack by the main body of surface craft, augmented by an aircraft carrier group, against the Cuba-Haiti area, which will be defended by a carrier group and two squadrons of Navy patrol planes operating from a "fleet air base."

Aerial War Games Test Air Defense Mechanism of Hawaii—Ground Base Advanced by Planes

A SERIES of attack and defense operations were carried out by the Air Corps and anti-aircraft defense units of the Hawaiian Department, March 11-13, during a three-day aerial war game. The enemy air force was assumed to have seized the Eastern portion of the Island of Hawaii and to have set up an air base at Hilo.

The maneuvers were concluded with a successful defense of Honolulu by the Eighteenth Pursuit Group, operating against a force of thirty-three enemy planes which staged a raid on Honolulu from a base on Molokai, over fifty miles distant. The attacking forces had planned to fly sixty miles to sea to the north and then approach Oahu over the central portion of the Koolau Mountain range. When spotted by the Fiftieth Observation Squadron on the defense near Koko Head, they abandoned this plan and made straight for the objective. Nineteen pursuit ships of the defending forces left Wheeler Field within two and one-half minutes after the word of the approaching invaders had been radioed by observers off Diamond Head. An aerial sham battle took place over Honolulu, with the defending forces successful.

CONTRACT for twelve diving naval bombing planes designed to increase the accuracy of aerial bombing has been awarded by the Navy Department to the Glenn L. Martin Company, Baltimore, Md. The contract involves a purchasing price of $525,000, and was awarded after rigid tests conducted over a period of several months.

This diving bombing plane is constructed to carry a 1,000-pound load through maneuvers which include vertical dives of 10,000 feet, and to release bombs while engaged in high-speed power dives.

OFFICIAL permission for two officers of the Imperial Japanese Army to visit the U. S. Army Air Corps post at Mitchel Field, L. I., has been granted by the Government, according to a recent announcement of the War Department. The officers are Lieut.-Col. Teramoto, retiring military attache to the United States, and Capt. Sonaga of the ordnance department of the Japanese army.

In the photograph below are (left to right) Lieut. Christy Mathewson, Lieut.-Col. Teramoto, Lieut.-Col. John Howard, C. O. Mitchel Field, Capt. Sonaga, Maj. William Ord Ryan, and Lieut. August Kissner.

Field-Gun Battery Transported by Aircraft in Air Corps Experiment

A FLIGHT to demonstrate the possibility of rapid movement of field artillery by air for purpose of Canal defense was successfully completed on March 20 by the personnel of the U. S. Army Air Corps at France Field, Cristobal, Canal Zone. A heavy field-gun battery composed of four 75-millimeter guns was flown from France Field to Rio Hato, 120 miles distant in the Panama jungle. The battery was set up and ready for action one hour and seven minutes after the take-off.

The guns were dismounted at France Field and loaded aboard three Air Corps bombing planes, three Sikorskys and one Ford transport.

Army Air Corps Develops Posts in Panama Canal Zone

A PROGRAM of development of permanent air defense facilities at both the Pacific and Atlantic ends of the Panama Canal has been initiated by the Army Air Corps.

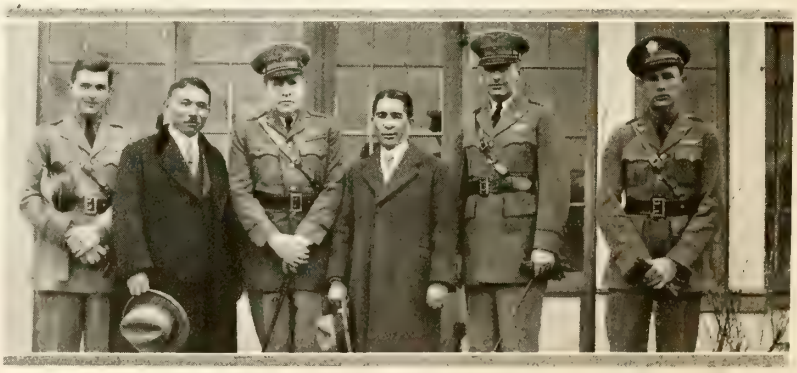
An extensive development program now under way at Albrook Field, a new Air Corps post at the Pacific terminus of the Panama Canal, will be completed in about two years. Construction of hangars, repair shops, warehouses and other buildings has been started at this field. The total cost of housing quarters will be approximately $3,500,000.

An improvement program at France Field, located at the Atlantic terminus of the Panama Canal, has been undertaken by the Air Corps. It is planned to expend more than $1,000,000 on technical construction and $2,500,000 on housing construction at this field.

National Guard Planes Will Participate in Annual Maneuvers of Air Corps

NATIONAL GUARD Observation Squadrons will participate in the annual maneuvers of the Army Air Corps to be held in May along the Atlantic Seaboard, according to a recent announcement of the War Department. Five service-type ships from each of the nineteen National Guard Observation Squadrons will take part in the maneuvers, being flown by members of the squadrons and Regular instructors on duty with them. Personnel of the National Guard will be on active duty status.

The National Guard planes will be organized in two groups of three fifteen-ship squadrons each, forming the Twenty-second Provisional Observation Wing.



Lt. Col. K. Teramoto and Capt. T. Sonaga, Imperial Japanese Army (civilian dress) recently inspected Air Corps post at Mitchel Field

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Vought Corsairs are noted for exceptional speed range, rapid climb, ability to get into and out of the smallest fields at all altitudes, and ample reserve power provided by their Pratt & Whitney "Wasp" engines.
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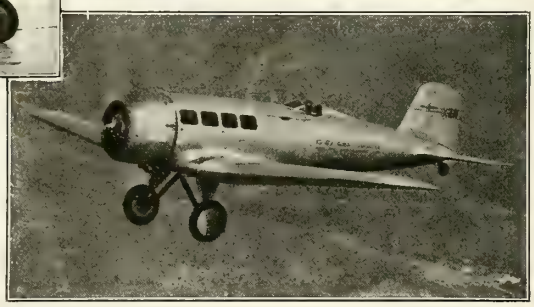
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NORTHROP AIRCRAFT CORP.

The Alpha Transport, the newest all-metal, low-wing monoplane, powered with Pratt & Whitney "Wasp" 420 H.P. engine, combines high speed and easy maneuverability with economical operations.
The unique all-metal construction provides a light but rugged structure giving a high ratio of pay load to total weight, together with low maintenance costs. This makes possible very reasonable total flying expense.
The enclosed cabin is equipped for 6 passengers. Can be adapted to express or combination passenger and express service.

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BUILDING AT NAVAL AIR STATIONS

REVIEW of the public works situation at Naval Air Stations is given by Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics, in his annual report as follows:

Lakehurst, N. J.—Practical tests of the mobile mooring mast have been continued with gratifying results. A tractor has been purchased and will be used for towing the apparatus. It is planned to conduct tests of a mobile mooring mast mounted on railroad car trucks and one has been designed and ordered by the Bureau of Yards and Docks.

Pensacola, Fla.—An additional flying field with an area of 190 acres has been leased for use in training. The field is about one mile from Corry Field. A comprehensive study for future developments at the Naval Air Station has been started by the Navy Yard Development Board. A contract has been awarded for improvements to the sewer system at the station. Permits for continued occupancy of private dwellings have not been renewed in preparation for eventual construction of modern and permanent buildings.

Cape May, N. J.—This station is in inactive status under the custody of the United States Coast Guard. A portion of the landing field is leased to the county for aeronautical purposes and two hangars and a runway are leased to the Atlantic Coast Airways Corporation.

Hampton Roads, Va.—Removal of two old kite-balloon hangars and one dirigible hangar has been authorized to improve the approaches to the station landing field and to reduce the hazards of flying. The facilities of the field have been augmented by the completion and equipment of a new shop and storehouse. It is proposed that the landing field at this base be extended and developed.

Anacostia, D. C.—A speed course for timing airplanes has been completed. The course extends from the Bellevue Pier to Jones Point Lighthouse near Alexandria and is 4,120.9 meters in length. A fireproof building for the testing of aircraft engines has been built and extensive repairs to the seaplane runway and apron have been completed.

Rockaway Beach, L. I., N. Y.—This station has been abandoned by the Navy Department and turned back to the City of New York. The Naval Reserve Unit formerly stationed at this base has been transferred to Valley Stream, L. I.

San Diego, Calif.—Among the improvements which have been made at this field are the construction of an additional airplane runway, shell house and magazine; and extension to paint and oil storehouse, erecting shop and shop building.

Seattle, Wash.—Construction of a barracks and mess hall for 360 men has been completed. Contracts have been awarded for the construction of an aircraft and engine overhaul shop, storehouse and seaplane runway.

Pearl Harbor, Hawaii—The following improvements have been made: Installation of a torpedo air compressor, and an automatic sprinkler system in the storehouse, extension to aircraft engine test building and repairs to the wharf.

Coco Solo, Canal Zone—Development of this Naval Air Station under the five-year building program has been made as rapidly as possible. Progress has been made on the contracts for officers' and non-commissioned officers' quarters and the barracks and mess hall for enlisted personnel. The kite-balloon hangar has been converted for use as a garage. Contracts for a new storehouse and an aircraft engine overhaul shop have been awarded. The gasoline storage tank which has a capacity of 90,000 gallons has been provided with a floating roof to reduce evaporation losses and fire hazard.

The only heavier-than-air craft which the Navy Department plans to base permanently at the Canal Zone will be seaplanes. Although the landing field is adequate for ordinary operations, the present field is too small to accommodate carrier-based planes when airplane carriers are based in the Canal Zone for long periods during maneuvers and in time of war. To facilitate naval aircraft operations by basing carrier aircraft at the station under these conditions, it is proposed that the present landing field be extended and developed.

Because of the rough seas which prevail in the vicinity of the station, it is proposed that the breakwater be extended to make a completely enclosed harbor.

Air Corps Awards Contracts Totaling $1,269,652.01 to Four Aviation Companies

CONTRACTS for aircraft and aircraft engines involving a total of $1,269,652.01 were awarded by the War Department on March 20.

The Verville Aircraft Company, Detroit, Mich., received a contract for four primary training planes and spare parts at a total cost of $27,227.88.

The Northrop Aircraft Corporation, Burbank, Calif., was awarded a contract for three transport planes and spare parts at a total cost of $62,600.90.

Contract for thirty observation planes and spare parts involving a total cost of $450,910.76 was awarded the Thomas-Morse Aircraft Corporation, Buffalo, N. Y.

The Pratt & Whitney Aircraft Company, Hartford, Conn., received a contract for 128 aircraft engines at a total cost of $728,912.50.

Navy Contracts for Twenty-five Vought Corsair O3U-1 Observation Planes

TWENTY-FIVE observation planes and spare parts costing $400,455 have been ordered from the Chance-Vought Corporation, Hartford, Conn., by the Bureau of Supplies and Accounts, Navy Department. The planes are of the 03U-1 type, an improved type "Corsair," the latest of the Vought series U0-1, U2U-2, U2U-3 and U2U-4.

This type of plane is employed in the Fleet on battleships and cruisers for observation work and on aircraft carriers as a scouting plane.

ANALYSIS OF NAVAL FLIGHT OPERATIONS

(Compiled from Annual Report of Rear Admiral William A. Moffett, Chief of Bureau of Aeronautics, for fiscal year 1930)

HEAVIER-THAN-AIR

Station	Number of Flights	Total Hours
Asiatic Fleet	2,131	1,884.10
Battle Fleet	51,873	65,876.50
Scouting Fleet	13,428	15,746.60
Anacostia	4,985	6,793.65
Coco Solo	3,903	4,594.60
Hampton Roads	10,311	9,855.40
Lakehurst	194	249.70
Pearl Harbor	4,661	5,799.80
Pensacola	99,145	96,958.55
San Diego	11,914	10,550.60
Dahlgren	643	654.80
Newport	546	548.45
Naval Academy	2,108	1,591.80
Gen. Inspr. Nav. Aircraft Dayton, Ohio	97	125.90
Nav. Air Factory, Phila.	1,717	965.70
Brazilian Mission	63	55.15
Nav. Attache, London	8	12.00
Naval Attache, Rome	39	54.00
Detroit, U. S. Naval Res.	2,397	1,749.25
Great Lakes, U. S. Nav. Res.	3,012	2,108.05
Long Beach, U. S. Nav. Res.	3,010	3,569.85
Minneapolis, U. S. Nav. Res.	1,291	1,274.65
Oakland, U. S. Nav. Res.	2,326	1,950.05
Philadelphia, U. S. Nav. Res.	1,218	1,160.25
Seattle, U. S. Nav. Res.	3,591	3,465.85
Squantum, U. S. Nav. Res.	2,306	2,473.85
Valley Stream, U. S. N. Res.	3,092	2,503.80
Total, U. S. Navy	230,009	242,572.90
Guam, marines	964	1,144.90
Nicaragua, marines	4,894	5,876.55
Port au Prince, marines	3,020	2,511.40
Quantico, marines	6,466	6,129.10
San Diego, marines	6,503	6,553.10
Total, marines	21,847	22,215.05
Total, Navy and Marine	251,856	264,787.95

LIGHTER-THAN-AIR

Type of Aircraft	Number of Flights	Total Hours
Non rigid airships	331	670.55
Dirigible (Los Angeles)	58	718.50
Metal clad	39	103.90
Free balloons	70	192.45
Kite balloons	745	495.65
Racing balloons	1	21.00
Total	1,244	2,202.05
Total heavier-than-air	251,856	264,787.95
Grand total	252,100	266,990.00

ANALYSIS OF PURPOSE

Purpose of Flight	Number of Flights	Total Tours
Training and instruction (Reg. students)	86,523	83,614.65
Training and instr. (Reserve students)	18,509	19,273.90
Training and instr. (qualified pilots)	5,225	5,425.60
Training and instr. (Res. personnel on active duty)	18,001	16,468.55
Familiarization and practice	20,941	20,643.95
Gunnery	20,826	16,199.50
Bombing	6,852	7,236.30
Torpedo	2,402	2,847.95
Observation	1,455	2,087.10
Scouting	3,203	5,743.25
Tactical	14,001	21,686.25
Navigation	582	990.15
Transportation of personnel	3,655	3,176.75
Ferrying of aircraft	3,247	3,811.10
Utility	2,734	3,282.90
Photography and mapping	952	1,302.85
Aerological	1,564	1,465.75
Tests of aircraft, engines, radio, etc.	14,615	11,947.15
Experimental	913	662.95
Administration	12,447	15,349.00
Cross country training	10,218	18,400.55
Pigeon training	31	40.20
Emergency relief work	110	167.50
Night flying	2,298	2,261.75
Special	552	702.35
Total	251,856	264,787.95

CONTRACT for seventeen complete parachute training outfits has been awarded the Switlik Parachute and Equipment Company, Trenton, N. J., by the U. S. Army Air Corps. Each outfit consists of a twenty-eight-foot back pack 'chute and a twenty-two-foot emergency chest pack 'chute.

AERONAUTICAL INDUSTRY

DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

Two-way radio conversation between persons on top of a skyscraper building and passengers in the Navy blimp J-4 flying 2,000 feet overhead, was successfully carried on at New York City in a demonstration which lasted more than one hour. (Feb. 26.)

(England.) Miss Delphine Reynolds took off from Croydon Airdrome on a flight to Cape Town, South Africa, accompanied by Flight Lieutenant H. G. Pudney. They will explore remote territory on the African Continent from the air. (March 1.)

(Algeria.) Two French pilots, Lucien Bossoutrot and Aime Rossi broke the world's distance and duration records for flight in a closed circuit by remaining in the air without refueling for seventy-five hours and twenty-three minutes during which they covered 5,468 miles. The flight was made at Oran. (March 1.)

Appropriations totaling more than $100,000,000 had been made for military, naval and commercial aviation when the 71st Congress adjourned. (March 4.)

A delegation of representatives of the Aeronautical Chamber of Commerce, headed by Charles L. Lawrence, made an annual visit to the White House and were received by President Hoover. (March 5.)

World's altitude record for women of 28,743 feet was established by Miss Ruth Nichols in a Lockheed Vega monoplane, taking off and landing at Newark Airport, Newark, N. J. (March 5.)

(Egypt.) The first plane took off from Cairo for Mwanza, Central Africa, inaugurating the North African division of Imperial Airways' projected London—Cape Town airline. (March 6.)

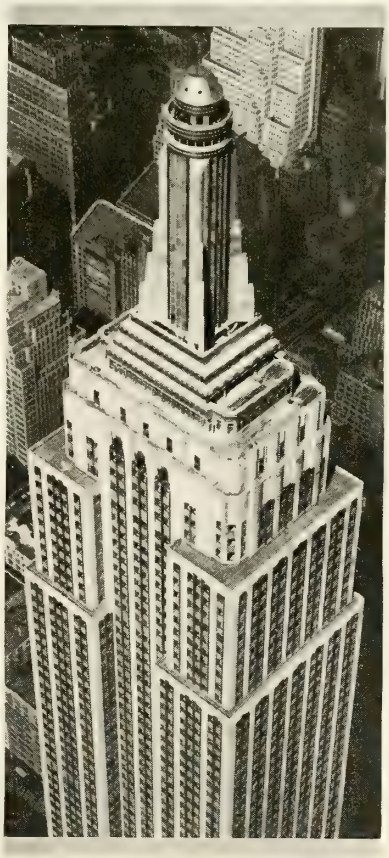
(France.) The Chamber of Deputies passed the 1931 air budget totaling $79,287,000. The total is $7,000,000 more than was appropriated for this purpose in 1930. Seventy-six per cent will be devoted to military aviation. (March 7.)

Capt. Frank M. Hawks landed at Glenn Curtiss Airport, North Beach, L. I. N. Y., completing a 193-mile flight from Boston, Mass., in fifty-two minutes. He flew the Travel Air Mystery S monoplane *Texaco 13*. (March 7.)

(France.) Pilots Regimensi and Lalouette landed at Le Bourget Airport after having broken the world's distance and duration records for planes carrying a useful load of 2,000 kilograms. Officials check of the instruments used on the flight indicated that they had set a new duration record of seventeen hours and three minutes, a distance record of 2,678.6 kilometers and an international speed record for the distance and the load of 157.99 kilometers per hour. (March 10.)

(Hawaii.) A three-day aerial war game, in which the Air Corps and anti-aircraft units in Hawaii participated, closed with a successful defense of Honolulu by the Eighteenth Pursuit Group, operating against a force of 33 "enemy" planes which staged a raid from a base on Molokai, fifty-five miles distance. The maneuvers were part of an aerial defense program being developed for Hawaii. (March 11-13.)

(Germany.) For the first time in the history of rocket experiments, a rocket containing scientific apparatus was successfully shot in the air during tests conducted near Bremen by Karl Poggensee. (March 13.)



(*Fairchild Aerial Surveys*)

The airship mooring mast on top of Empire State Building, New York City

(England) The House of Commons passed the 1931 air budget of 18,000,000 pounds sterling ($87,390,000). (March 17.)

A 225-mile flight from New York City to Washington, D. C., was completed in one hour, four minutes and fifty seconds by Miss Ruth Nichols in a Lockheed Vega monoplane. (March 17.)

(Panama Canal Zone) A heavy field-gun battery composed of four 75-millimeter guns was transported by aircraft from France Field to Rio Hato, 120 miles distant in the Panama jungle, set up and ready for action one hour and seven minutes later in an experiment conducted by the Air Corps to test the practicability of transporting artillery for the purpose of Canal defense. (March 20.)

Rigid trials of "sustained offensive and defensive capabilities" of the Navy's air forces were conducted by the U. S. Navy Department in a series of air maneuvers in the Caribbean Sea. (March 23-31.)

(France) Seven world's records for speed, distance and duration for planes carrying 2,000 kilograms (4,400 pounds) over a closed circuit were established by Joseph Lebrix and Marcel Doret. They set new records for endurance with loads of 500, 1,000 and 2,000 kilograms; for distance with the same loads and a speed record for a distance of 2,000 kilometers carrying a weight of 2,000 kilograms. They traveled approximately 4,021 kilometers (2,513 miles) on the flight. (March 24.)

The Third National Airport Conference was held at the Mayo Hotel, Tulsa, Okla. (March 25-27.)

Dr. Kimball Honored

AS a mark of appreciation for his service to trans-atlantic flight, Dr. James H. Kimball, associate meteorologist of the United States Weather Bureau in New York City, was admitted as an honorary member of the Ligue Internationale des Aviateurs on March 14 at a luncheon at the Park Central Hotel, New York City. Dr. Kimball is the first man other than an active pilot to be so honored by the association. He was presented with a gold plaque "in recognition of his assistance in the development of aviation" and "in behalf of international peace."

WALTER F. PARKIN has been appointed Chief of the Inspection Service of the Aeronautics Branch, Department of Commerce, according to an announcement made by Gilbert G. Budwig, Director of Air Regulation. Mr. Parkin formerly was one of the assistant chiefs of the Inspection Service.

LIST OMAHA AIR RACE EVENTS

OFFICIAL schedule of events of the Omaha Air Races, to be held at the Municipal Airport, Omaha, Nebraska, May 15-17, has been announced by Phil T. Henderson, general manager of the races.

Mr. Henderson announced that a fleet of sixty-six Army Air Corps planes, en route to Dayton, Ohio, for concentration for the annual maneuvers scheduled on the Atlantic Seaboard May 17-30, will usher in the Omaha meet. The Air Corps fleet has been ordered to Omaha for an over-night stop May 14, according to an announcement from Washington, D. C. The Omaha Junior Chamber of Commerce through the Omaha Air Race Association is sponsoring the races.

The schedule of events and prizes is as follows:

1.	OX5-OXX6 open cockpit or cabin	$375.00
2.	200 cu. in. or less, open cockpit or cabin	275.00
3.	275 cu. in. or less, open cockpit or cabin	275.00
4.	350 cu. in. or less, open cockpit or cabin	275.00
5.	450 cu. in. or less, open cockpit	275.00
6.	450 cu. in. or less, cabin	275.00
7.	500 to 800 cu. in. open cockpit	375.00
8.	500 to 800 cu. in. cabin	375.00
9.	Free-for-all, under 500 cu. in.	525.00
10.	Free-for-all, 500 to 1000 cu. in.	525.00
11.	Free-for-all, any displacement	700.00
12.	Women's free-for-all, any displacement	525.00
13.	Amphibion race	150.00
14.	Bomb dropping, each day	450.00
15.	Dead stick landing, each day	450.00
16.	Balloon bursting, each day	450.00
17.	Parachute drop to mark, each day	150.00
18.	Navy exhibition	trophies
19.	Army exhibition	trophies
20.	National Guard exhibition	trophies
21.	Civilian acrobatic exhibition	trophies
22.	Speed and efficiency contest	275.00

Ruth Nichols' Record Official

CONTEST Committee of the National Aeronautic Association has announced that Miss Ruth Nichols, piloting a Lockheed Vega, powered with a Pratt and Whitney Wasp 425 horsepower engine, at Jersey City Airport on March 6 attained an altitude of 28,743 feet. This is an international record in the women's category, subject to confirmation by the Federation Aeronautique Internationale.

NATIONAL AIR TOUR OF 1931

TENTATIVE itinerary of the National Air Tour of 1931 for the Edsel Ford Trophy was recently announced. The tour, scheduled to leave Detroit, Mich., July 4 and return July 25, will cover approximately 6,425 miles through the South and Southwest as far as Mexico City, Mexico. As in former years, the tour will start from the Ford Airport in Dearborn.

Leaving Dearborn, the tour will visit the following cities: Buffalo and Binghamton, New York; Bradford, Pa.; Columbus, Ohio; Evansville, Indiana; Memphis, Tennessee; Birmingham, Montgomery and Mobile, Alabama; New Orleans and Shreveport, Louisiana; Houston, Corpus Christi and Brownsville, Texas; Tampico; Mexico City, Leon, Agua Caliente, Zacatecas and Torreon, re-entering the United States at Eagle Pass, New Mexico; Austin and Wichita Falls, Texas; Ponca City, Oklahoma; Little Rock, Arkansas; Vicksburg or Jackson, Mississippi; Nashville or Murphysboro, Tennessee; Lexington, Kentucky; Huntington and Wheeling, West Virginia; Akron, Ohio; finishing at Detroit.

The officials of the National Air Tour of 1931 are as follows: E. W. Cleveland, chief starter; Ray Brown, assistant starter; James Doolittle, referee; N. V. Johns, assistant referee; Walter Lees, chief timer; Thomas Colby, assistant timer; Arthur Schlosser, chief scorer; Harry Slater, assistant scorer; E. P. Crocker, assistant scorer; and Peter Altman, chairman, rules committee.

UNITED AIRCRAFT & TRANSPORT CORPORATION earned for the year ended December 31, 1930, a net income of $3,302,206.65 after deduction of Federal income tax or the equivalent of $1.64 per share on the average outstanding common stock for the year, according to the annual report to stockholders issued recently by F. B. Rentschler, president of the corporation. During 1930 the operating revenues and aeronautical equipment sales amounted to a total of $29,989,835.74.

COMING AERONAUTICAL EVENTS

April 11-19. International Aircraft Show, Detroit, Mich., sponsored by Aeronautical Chamber of Commerce and Aircraft Bureau, Detroit Board of Commerce.

May. Annual maneuvers of Army Air Corps along Atlantic Seaboard.

May 1-10. Aeronautical, Industrial and Commercial Exposition, Balbuena Field, Mexico City, Mexico.

May 8-10. Air meet, auspices Binghamton Airport Company and Binghamton Chamber of Commerce, Binghamton, N. Y.

May 12-14. Fifth National Technical Aeronautical Meeting, A. S. M. E., Baltimore, Md., sponsored by Engineers' Club of Baltimore.

May 15-31. International Aero Exhibition, Stockholm, Sweden.

May 15-17. Omaha Air Races, Omaha, Neb.

May 23. Dedication of Floyd Bennett Field, New York, N. Y.

June. Third Annual Michigan Air Tour, sponsored by Grand Rapids, Mich.

June. First Annual Aviation Country Clubs Seaplane Cruise, sponsored by Amateur Air Pilots Association, on Atlantic Coast.

July 4-25. Tentative date of the National Air Tour of 1931 for the Edsel Ford Trophy, starting and ending at Detroit, Mich.

August 23-Sept. 1. Tentative date of National Air Races, Cleveland, Ohio.

September 12. Schneider Trophy Race over the Solent and Spithead course, Southampton, England.

AVIATION CORP. TO BUILD TRANSPORTS

CONSUMMATION of the plan for the partition of Fairchild Aviation Corporation subsidiaries was announced at the time this publication went to press, by Frederick G. Coburn, president of The Aviation Corporation. The plan accomplishes the withdrawal of The Aviation Corporation from participation in the activities of the Fairchild Aviation Corporation through its relinquishing its majority share holdings in the Fairchild corporation. In addition, the plan involves acquisition in their entireties of two Fairchild subsidiaries—the Fairchild Airplane Manufacturing Corporation and Fairchild Engine Corporation. These two companies are to be combined into the American Airplane and Engine Corporation. This name was chosen because it identifies the manufacturing unit with the operating unit, American Airways, which is also controlled by The Aviation Corporation.

By the consummation of this plan, The Aviation Corporation acquires full ownership of the two Fairchild subsidiaries most closely related to its transport business. These two companies occupy the property at Farmingdale, L. I., and The Aviation Corporation will have full use of the facilities which exist there for development and experimental work, testing and servicing of its transport ships. The other subsidiaries are being retained by the Fairchild Aviation Corporation.

Coincident with the restitution of the Fairchild corporation, The Aviation Corporation has made arrangements to acquire all of the common stock of the Faircam Realty Corporation, which owned the Farmingdale real estate and leased it to the airplane and engine Fairchild companies. This realty company will be merged into the American Airplane and Engine Corporation.

The Aviation Corporation, at the time the plan was formulated, owned 298,000 shares of the 541,240 shares of stock of the Fairchild Aviation Corporation outstanding. According to Mr. Coburn, stockholders were given the option of retaining their interest in the Fairchild corporation after the sale of the two subsidiaries to The Aviation Corporation, or converting their stock into shares of The Aviation Corporation. Sherman Fairchild and other minority stockholders announced their intention of retaining their interest in the Fairchild corporation in the belief that this arrangement would be more satisfactory to all stockholders.

Curtiss-Wright Gives Public Lectures

FOR the purpose of giving the public a better understanding of aviation and bringing attention to the pleasure and usefulness of flying, the Curtiss-Wright Flying Service has opened a series of lectures at several of their ground schools for which no admission is charged and which anyone sixteen or over may attend.

In addition to pilots and ground school instructors, the speakers at these meetings will include those who have been successful in aviation.

葉林航中我
此博空國們
校爾者来所
也曾乃此以
緋因學由

Which Means...



"We Came All the Way from China to Learn Aviation Where Lindbergh Learned"

AN old proverb says the Chinese are clever. Clever or not . . . two Chinese youths know where to get the highest type of flying instruction. Phillip Chinn and George Chinn, shown in the photo above, came all the way from Canton, China, to Lincoln . . . where Lindbergh learned . . . to learn aviation at the Lincoln Airplane & Flying School . . . because they wanted the highest type of training.

You, too, come to this Lincoln School . . . which sets the highest standards for the best training offered by any school. Train for success in the world's biggest-paying, fastest-growing industry!

Be an Air Mail Pilot...Earn $550 per Month

Last year air mail and transportation companies paid pilots an average salary of $550 per month. Hundreds of other flyers made big money piloting planes for large companies and private individuals. The best positions go to pilots having the highest type of training . . . such as you get at this Lincoln School.

Lincoln Trained Pilots are Preferred because operators know Lincoln graduates are finished pilots. Our flight instructors are government licensed and seasoned by long experience. We train you on four distinct types of planes . . . biplanes, monoplanes, open and cabin types; including a six place transport cabin ship with J-6 Wright Whirlwind motor. We give you maximum amount of dual training, and prepare you for your Dept. of Commerce test for pilot's license . . . with use of training plane for this test without additional charge. Every student pilot is given 400 hours transport pilots' ground and mechanics' course without extra charge.

Lincoln an Ideal Place to Learn . . . Located in a plains country, with no dangerous forests, mountains and river banks. Safe emergency landing fields for hundreds of miles around. Lincoln is on two air transport lines. Contains two large aircraft factories.

Large Mechanics' School with Aircraft Factory in Connection . . . Big opportunities also for licensed airplane mechanics. We teach you by factory standards how to rebuild and rig airplanes for flight, to rebuild wings, fuselages, aircraft motors; also aircraft welding and aerial radio. **Our Master Airplane and Engine Mechanics' Course** qualifies you for Dept. of Commerce examination for mechanic's license.

Our Employment Department assists students in finding part time employment while in training, and graduates to locate permanent positions.

Students from Everywhere!

We have had students from South Africa, Scotland, Canada, Alaska . . . and now China. The fame of the Lincoln School . . . as a producer of high quality pilots . . . has spread far and wide.

If you are looking for cheap training, don't bother about writing us. Those who have tried it, know that cheap training is dear at any price. But if you are looking for the highest type of training . . . training which will qualify you for the most responsible positions . . . then come to this school.

To be a Lincoln Graduate is your best guarantee of a responsible position.

Here you will find an institution established 21 years; with $250,000 worth of buildings and equipment, a $100,000 airport, all weather runways, lighted for night flying. This school is operated under regular inspection of the Aeronautical Division of the U. S. Dept. of Commerce.

EN ESPANOL

Ofrecemos enseñanza en español en los cursos de Aviación que se enseñan en esta Escuela.
Nuestro Colegio está autorizado por el Gobierno de los EE. UU. para traer estudiantes del extranjero. Pida informes gratis.

CATALOG ON REQUEST

Contains complete information about the Lincoln School and your opportunities in aviation. Also liberal part time employment offer to help pay cost of board and room of students who enroll now. Mail coupon today if you mean business.

MAIL THIS COUPON!

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398 Aircraft Bldg., Lincoln, Nebr.

Gentlemen: Please send me your catalog, "Aviation Beckons You," containing full information about the Lincoln School and reasonable tuition.
I am interested in:

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Town..... State.....

LINCOLN
AIRPLANE and FLYING SCHOOL
Ground and Flying School Government Approved

FOUNDER AGAIN HEADS FAIRCHILD

THE Fairchild Aviation Corporation, for the past two years controlled by The Aviation Corporation through its ownership of 298,000 shares of Fairchild stock, is again an independent organization headed by Sherman M. Fairchild, its founder. Stockholders of the Fairchild Aviation Corporation met last month at Wilmington, Del., and ratified an agreement with The Aviation Corporation, which reduced their company's outstanding common stock from 541,240 shares to 213,327 shares. This reduction was accomplished by giving The Aviation Corporation certain assets of the Fairchild corporation in exchange for the common stock of the latter.

Under the new arrangement the following companies are under the control of the Fairchild Aviation Corporation: Fairchild Aerial Camera Corporation, Fairchild Aerial Surveys, Kreider-Reisner Aircraft Corporation and Fairchild Aircraft, Ltd., a Canadian company.

The Fairchild organization was originally formed in February, 1920, to manufacture automatic aerial cameras, under the name of Fairchild Aerial Camera Corporation. The following year, Fairchild Aerial Surveys was formed and, in 1922, Fairchild Aerial Surveys of Canada was organized. Expansion of the company's activities continued with the formation in 1925 of the Fairchild Airplane Manufacturing Corporation and the Fairchild Engine Corporation. These corporations were controlled through Fairchild Aviation Corporation, incorporated in 1927. In 1929 control of the Kreider-Reisner Aircraft Corporation was acquired. In 1929, The Aviation Corporation was organized with Graham Grosvenor, former president of the Fairchild Aviation Corporation, as president and Sherman Fairchild as vice president of The Aviation Corporation. The Aviation Corporation purchased 150,000 shares of the common stock of the Fairchild Aviation Corporation. Enough additional stock was acquired from stockholders to give The Aviation Corporation control of Fairchild Aviation Corporation through the former's ownership of 298,000 out of 541,000 shares of Fairchild.

However, at the recent meeting of Fairchild stockholders, the new arrangement was agreed upon to finance the development of new products on a basis satisfactory to both majority and minority stockholders.

At the time of going to press, it is still undecided which, if any, of the airplane models manufactured by the Fairchild organization when a subsidiary of The Aviation Corporation, will continue in production. It is understood, however, that both the American Aircraft and Engine Corporation and the Kreider-Reider unit of Fairchild plan to introduce several new ships.

National Aviation Clubs

MORE than 500 members and guests gathered for the first club night of the Greater New York Chapter, National Aviation Clubs, at the club rooms, February 25. W. Hawley Bowlus spoke on the development of gliding and showed his series of moving pictures including those of Colonel and Mrs. Lindbergh's first lessons in gliding; Captain A. C. McKinley, of the Byrd Expedition, told of the flight to the South Pole, and Jack O'Meara spoke of the first glider flight over New York, and described other experiences. Mahlon Thomas presided. This was the first of a series of club nights at which addresses will be made by pilots and experts on various phases of aeronautics.

STANDARD Oil Company of New York has announced that the second commercial Autogiro sold in the United States, purchased by the company from Pitcairn Aircraft, Inc., will be used for research work and testing lubricants for Autogiros.

AMPHIBIONS, INC., Garden City, L. I., recently reported the following sales of planes:

DeLuxe "Privateer" 110 horsepower Warner, to Lamont DuPont, Jr., Wilmington, Del.; Ireland J-6 300 five-place cabin amphibion, standard to R. T. Menard, Fall River, Mass. One Wasp 425 horsepower 5-place cabin Special De Luxe to J. F. Holmes, Port Washington, N. Y.

The following dealers were recently appointed: Air Service, Inc., New Castle, Del., Delaware distributors; and Chambers, Cooper & Rowntree, Montreal, Canada.

MODEL supplies and construction kits of all-balsa wood of the Curtiss Hawk, Travel Air Mystery S and the Curtiss Condor transport have been prepared by the Curtiss-Wright Corporation. Each kit contains parts and fittings together with a book of instructions and a blue print scaled to accurate dimensions. With a few modifications these scale models may be made to fly.

STUDENTS of the Guggenheim School of Aeronautics, New York University, have organized a glider club. E. J. Demas is president of the club.

EARLY in May 1929, the Daniel Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education, New York University, extended its teachers-training program to include a special intensive course for the training of teachers in aviation ground school subjects. These courses are designed to enable the student to pass the Department of Commerce examinations for a ground-school teacher's license and will give practical preparation for the teaching of the subjects now required by the Department of Commerce for the curriculum of ground schools.

RHODE ISLAND

[A. R. JOHNSON]

Constructing State Airport

A total of $243,894.78 of the $300,000 made available in 1929 for the establishment of a state airport had been expended up to December 31, 1930, according to the annual report of the State Airport Commission presented in the Senate recently by Senator Harry T. Bodwell of Cranston, chairman of the commission.

FIRST meeting of the Rhode Island Aviation League, model airplane division, was held March 17 at the Y. M. C. A., Providence, R. I.

SOLO SYSTEM OF FLIGHT TRAINING

THE Solo System of Flying Instruction was in operation March 22 at the Glenn Curtiss Airport, North Beach, Queens, L. I., according to a recent announcement of the sponsors of the system. Demonstrations of the various units of equipment which are used in instructing the student pilot were made by several licensed pilots. In addition, students received regular flight instruction.

The Solo system is designed to familiarize the student pilot with airplane controls before leaving the ground. The equipment consists of a coordinator, taxiplane, altigauge, accounter, glider and soloplane.

The course is one in which the student first learns to fly himself without the necessity of dual instruction; it is intended to qualify the student as a pilot by degrees. The students first learns the feel of the controls with the coordinator and a taxiplane. The coordinator is mounted on a framework and simulates the movements of a moving airplane, oscillating in the blast from the fan. Next, the taxiplane is used. This is a small craft which does not leave the ground, being used to familiarize the student with ground control and the operation of the controls in a moving craft. The third stage of training is glider flying, the student learning to land and turn in the air. The final phase of training includes flight in a low-powered plane, the student flying with an instructor acting as a safety check. The student is then advanced to the stage in which he can fly this ship solo. All advanced training is then given in dual control planes.

PENNSYLVANIA

NEW headquarters of the Aero Club of Pennsylvania, 1339 Walnut Street, Philadelphia, Pa., were opened March 12 with an aviation salon and an exhibit of aviation prints and photographs. The new headquarters will serve as a meeting place for members of the club, as a general aeronautical information bureau and as an aviation library open to the general public. The Putnam *New York Times* exhibits of aviation prints and photographs, which was shown in New York City for several weeks, will be exhibited until April 15.

The club will conduct without charge elementary ground school aviation courses open to boys and girls of high school age.

PHILADELPRIA

[R. GARD]

Autogiros at Pitcairn Field

ACCORDING to a recent announcement, the use of the present type of airplane for passenger carrying and instruction work will be discontinued at Pitcairn Field. The field's entire equipment of airplanes will be sold.

CABLE ADDRESS USAIG, NEW YORK

UNITED STATES AVIATION UNDERWRITERS

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80 JOHN STREET
NEW YORK CITY

DAVID C. BEEBE
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UNDERWRITING MANAGERS
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ST. PAUL FIRE AND MARINE INSURANCE COMPANY
UNITED STATES FIRE INSURANCE COMPANY

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(Other Casualty Lines)
AETNA LIFE INSURANCE COMPANY
(Workmen's compensation and employer's liability)
CENTURY INDEMNITY COMPANY
HARTFORD ACCIDENT & INDEMNITY COMPANY
MARYLAND CASUALTY COMPANY
NEW AMSTERDAM CASUALTY COMPANY
UNITED STATES FIDELITY & GUARANTY COMPANY

ASSOCIATE FIRE MEMBERS:

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CENTRAL STATES FIRE INSURANCE COMPANY
CITIZENS INSURANCE CO. OF NEW JERSEY
CONNECTICUT FIRE INSURANCE COMPANY
EQUITABLE FIRE & MARINE INSURANCE COMPANY
HARTFORD LIVE STOCK INSURANCE COMPANY
MINNEAPOLIS FIRE & MARINE INSURANCE COMPANY
NEW JERSEY INSURANCE CO.
NEW YORK UNDERWRITERS
NORTHWEST FIRE & MARINE INSURANCE COMPANY
RETAILERS FIRE INSURANCE COMPANY
STANDARD FIRE INSURANCE COMPANY
TWIN CITY INSURANCE COMPANY
WORLD FIRE & MARINE INSURANCE COMPANY

After April 1, the field will become a sales and servicec depot for the Autogiros produced by Pitcairn Aircraft, Inc. Sightseeing flights will be a thing of the past and instruction will be confined to prospective Autogiro owner-pilots.

Experiments are being conducted at the field with a small Autogiro corresponding in size to the popular-priced two-place biplane used extensively for training and sport purposes.

To Reopen Airline to Atlantic City

STARTING April 15th, the Ludington-Philadelphia Flying Service will reopen its airline to Atlantic City. Four planes will be operated daily between the two cities. Trimotored Stinsons will be used.

C. T. LUDINGTON, of the Ludington flying interests, was recently appointed chairman of the aviation committee of the Philadelphia Chamber of Commerce. His appointment was made by Philip Gadsen, president of the chamber.

PITTSBURGH

[S. W. THEIS]

STUDENTS in the university of Pittsburgh enrolled in courses designated as Commercial Aviation 153-154, conducted in conjunction with the Penn School of Aviation, were the guests of that company on a series of inspection tours of the Pittsburgh-Butler Airport.

PITTSBURGH'S "flying fraternity" turned out en masse for the annual Aero Club Ball, held in the Hotel William Penn. Officers and men of the Reserve Observation Corps stationed at Rodgers Field attended.

THE Penn School of Aviation now operates a branch flying school from Curtiss-Bettis Airports. A field office for pilots and students of the school has been installed in one of the hangars. Two of the Fleet trainers of the school have been transferred to the Bettis Field branch and are being used daily for instruction. Students of the Penn School may take flying instruction from either the home port at Pittsburgh-Butler Airport or at Curtiss-Bettis Airport.

PIONEER TEST INSTRUMENT KIT DEVELOPED

THE Pioneer Instrument Company has developed a special portable kit containing four instruments for testing the performance of aircraft in flight. Four sets of this test instrument equipment were recently ordered from the company by the Aeronautics Branch of the Department of Commerce for use at its engineering bases.

The kit contains the following instruments: a clock equipped with a stop hand and another hand which can be manually set by means of a knob in the center of the front glass; air speed indicator, a specially calibrated low range instrument with graduations at each two miles per hour; rate of climb indicator; and an altimeter, with case completely sealed except for a static connection mounted directly under the air speed indicator A change in altitude of ten feet is indicated on the altimeter by a pointer movement of approximately one-eighth of an inch.

A trailing pitot static tube is used in conjunction with the equipment.

MARYLAND

[E. W. WALSH]

Commission Urges Legislation Favoring Aviation Industry

FOUR bills constituting a code of airplane law for Maryland, have been drawn up by the State Aviation Commission and will be presented to the Maryland General Assembly, now in session. All of the bills were written in the hope of attracting aviation companies to this state, principally by relieving them of the inequalities that would result if they were compelled to operate under existing laws enacted to deal with other types of carriers.

THE Maryland State Aviation Commission will seek, through the Maryland General Assembly, funds for carrying on the work of the commission. Tentatively $10,000 will be sought. Clarence W. Whealton, a member of the Maryland General Assembly, also a member of the commission and sponsor of the aviation laws in Maryland, will introduce a measure to this effect.

The commission is composed of Mr. Whealton, Dr. Hugh H. Young, who is chairman; Major Charles Masson, Commanding Officer of the State National Guard Air Force; Lieut.-Com. Dewitt C. Ramsey, flying instructor at the Naval Academy, and Benjamin H. Brewster.

THROUGH an amendment to its charter the Chevrolet Aircraft Corporation, of Baltimore, Md., has changed its corporate name to the Glenn L. Martin Motors Company. There was no increase in its authorized capital stock. Glenn L. Martin is president of the concern which is a subsidiary of the Glenn L. Martin Aircraft Company and is engaged in the manufacture of airplane engines.

OHIO

Waco Produces Cabin Plane

THE Waco "Model C," a four-place cabin biplane, has been anounced by the Waco Aircraft Company of Troy, Ohio. The ship marks the entry of Waco into the field of cabin airplanes.

The plane is powered with a Continental 165-horsepower engine and is equipped with metal propeller, motor cowl ring, electric starter, dual controls including brake controls with locking feature, air-cushion wheels and brakes and tail wheel.

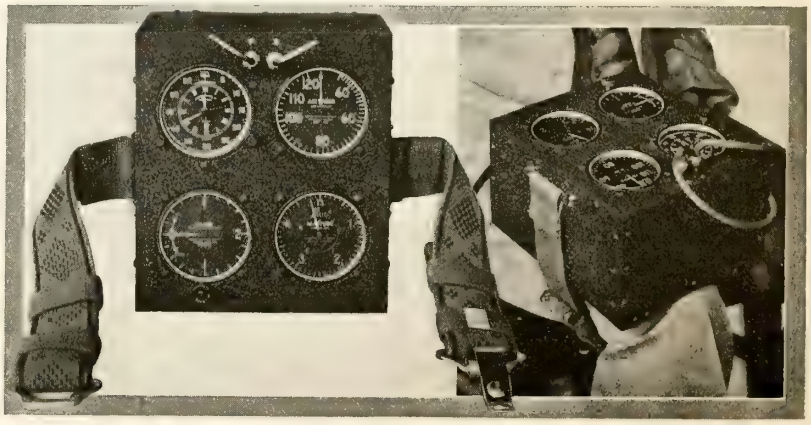
A SMALL electric polisher known as U. S. Model No. 1, has been announced by the United States Electrical Tool Company, Cincinnati, Ohio. The polisher weighs approximately eight pounds, has a speed of 900 revolutions per minute, uses seven-inch polishing pads and operates by universal motor on alternating or direct current.

[T. E. LUNSFORD]

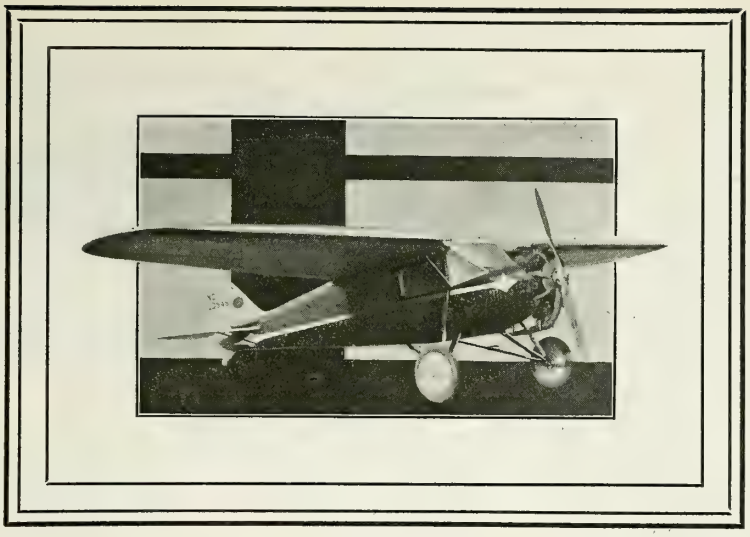
Bill Amends Air Code

THE Ohio House of Representatives has passed the bill by Representative Earle L. Johnson, Lake County, amending the Ohio aeronautics code to make it conform with regulations of the U. S. Department of Commerce. The Johnson measure would make mandatory the acquisition of a license by every flier. It also would increase from $25 to $50 the fee the state may charge a municipality for air marking. Permission for a city to lease and purchase property outside of corporation limits for airport purposes also would be granted in the bill. The House voted to increase the salary of the State Director of Aeronautics from $3,600 to $5,000.

AIR mail and passenger service between Cleveland and Detroit will be resumed April 1. Six amphibions will fly the 55-minute schedule across Lake Erie, offering the same service that was discontinued last fall. On the same date, through service will be inaugurated between Chicago and Detroit, using multi-motored radio-equipped planes. This will link Cleveland, Detroit and Chicago.



Pioneer Test Instrument kit containing four instruments for testing aircraft in flight



Designed For a Purpose

EVERY airplane is designed for a purpose. The Swanson Coupe is designed for private flying—sport and business—and for instruction. Hence the dual controls and rich appointments. The finest automobile is no more luxurious or comfortable than this sleek coupe of the air. The Swanson Coupe is in every sense of the word a fine airplane. Fine in performance. Fine in construction. Fine in appearance.

A remarkably wide range of vision assures utmost safety in flight. A specially designed wing truss which eliminates all external struts and wires makes possible the "glass roof." Full visibility overhead thus provides a true unobstructed view in all directions.

Here are a few of the features which appeal to the private flier: side-by-side seating, automobile doors with crank-up windows, shatterproof glass, large luggage compartment, Chase mohair upholstery, oildraulic shock absorbers, semi-balloon tires, brakes, complete dashboard.

The Swanson Coupe travels 125 miles an hour wide open, cruises at 95, lands at 40, and climbs 1000 feet a minute. It has a radius of 625 miles on a full tank. Dealers and distributors write for details of territorial assignment and franchise rights.

Powered with WARNER "SCARAB" 110 h.p., 7 cylinders. Standard Model $4,450 f.o.b. DeLuxe Model $4,985 f.o.b.



Approved by the Department of Commerce

SWANSON AIRCRAFT COMPANY

Incorporated

HOPEWELL, VIRGINIA

THE NEW aeronautics institute of the University of Akron will be completed this fall. Work on the institute, funds for which have been donated by the Guggenheim Foundation, will begin this spring, according to George F. Zook, president of the university. The institute building will be at the Akron Municipal Airport, near the dock of the Goodyear-Zeppelin Corporation.

PORT COLUMBUS has been made district headquarters for the distribution of Stinson Aircraft Corporation products. A. S. Koch will be in charge of sales and service.

INCORPORATION papers have been issued by the Secretary of State to the Aero Instructor, Inc., Cleveland, Ohio, capitalized at $1,000. The incorporators are Milton J. Harris, E. T. Johnson, and D. D. Unger.

NET profit in 1930 of the Truscon Steel Company, manufacturers of equipment for airports, Youngstown, Ohio, amounted to $1,200,531, after costs and expenses, but before depreciation and Federal taxes, compared with gross profit of $3,410,784 in 1929 after similar deductions.

THE Mason-Dixon airline, operating passenger planes between Cincinnati and Detroit and which suspended operations for the winter, will resume plane service between the two cities in April.

COLUMBUS

[W. DONALD WALTER]

FLYING activity at Norton Field has been somewhat curtailed recently, due to unfavorable weather conditions. The mechanics have moved all the PT's to the east hangar, leaving only the two 02's in the west hangar, which was formerly so crowded that it was usually necessary to roll out four or five of the PT's every time someone wanted an 02.

COLUMBUS pilots were interested to learn that Walter Avery has been placed in charge of all photographic flying for Curtiss-Wright. Avery, who is a native of Columbus, was overseas as a pursuit pilot during the war, got several German planes, and spent some time in a German prison camp. Before his connection with Curtiss-Wright as manager of the Valley Stream base, Avery was with the Airways Division of the Department of Commerce.

ONLY one Columbus man, Fred C. Schulz, is among the March 1 class of Flying Cadets ordered to report at March Field. At the present time, this city is represented in the Service schools by Cadets Morehouse and Stephan, who are now at Kelly in the Advanced Flying School of the Army Air Corps.

INDIANA

THE American Propeller Company, formerly Paragon Engineers, now a division of Bendix Aviation Corporation, manufacturers of the Paragon Aircraft Propellers, have moved their entire plant and equipment to South Bend, Indiana, where they will occupy a new factory as part of the general set up of the Bendix Aviation Corporation.



Waco Model "C" four-place cabin biplane powered with Continental 165 h.p. engine

KENTUCKY

[A. W. WILLIAMS]

ANNOUNCEMENT has been made of plans whereby work is to start at Bowman Field, Louisville, not later than April 1, on a new hangar for the use of the Army Air Corps, a deficiency bill having recently been signed, calling for $87,000 for use on improvements of the Federal division of the local airport. The new building will be 120 feet by 240 feet, with two attached leantos, twenty feet by 120 feet, to house offices, supply rooms, etc. There will be radio, photographic and shop departments.

Additional appropriations have been asked, including $20,000 for a heating plant, for this new hangar; and $18,000, already authorized, for construction of concrete runways and gas and oil storage systems.

MICHIGAN

Detroit Aircraft March Sales

GROSS monthly sales of the Detroit Aircraft Corporation for 1931 have exceeded by 30 per cent the record of last year, according to Karl S. Betts, general sales manager. The company reports gross sales of $60,300.00 for the first two weeks in March. Present indications are that deliveries of aircraft equipment will be speeded up during the spring and summer months.

APPROVED TYPE CERTIFICATE 405 has been issued the Buhl "Bull Pup," manufactured by the Buhl Aircraft Corporation, Marysville, Mich., according to a recent announcement of officials of the company.

Continental Engine Company

THE Waco Aircraft Company, Troy, Ohio, has adopted the Continental Model A70 second series engine as standard power plant for its 1931 models, according to Willis C. Brown, director of sales, Continental Aircraft Engine Company, Detroit, Mich. The new models are the Waco F-2 three-place open biplane, and Waco C four-place cabin biplane.

Since the Continental A40 engine for light airplanes was announced in February inquiries have been coming in at the rate of about fifteen per day, according to Mr. Brown. The inquiries are from individual prospective buyers of light aircraft, as well as from builders, indicating a great public interest in light aircraft this year both from a designing and consumer standpoint.

Production on the Continental A40 engine is continuing at the rate of three a week.

Michigan Council of Glider Clubs

THE Michigan Council of Glider Clubs was organized in the fall of 1930, for the purpose of uniting the glider clubs of Michigan in order to secure suitable terrain for advanced gliding and soaring. Fifteen clubs are now active in this group.

A suitable hill has been procured for secondary training and is being cleared by the members. It is planned to buy a donkey engine and hoist to pull the gliders up the hill. Automatic devices will be used to launch the gliders. The site is thirty-five miles from Detroit and may be easily reached by paved highways. It is known locally as Grampion Hills and is located two miles northeast of Lake Orion, Mich.

The glider exhibition at the National Aircraft Show is sponsored by this group and all the flying will be done by its members.

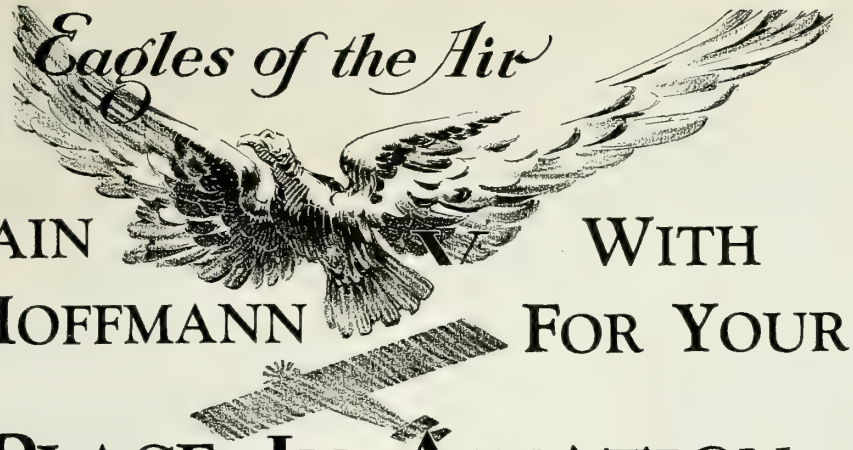
A contest on the new hill is planned May 2-3. Prizes totaling $100 have been subscribed and donations from local merchants will swell the total before the meet.

The officers of the council are: Richard Brown, Detroit Glider Club, president; Frank Hole, ABC Glider Club, secretary; and Robert W. Duncan, Detroit Glider Club, chairman of terrain and publicity.

[J. M. HILL]

To Vote on Airport Funds

VOTERS of Michigan will decide at the state election in April whether or not the state shall have the constitutional right to spend its funds for the establishment and development of airports The question will appear on the ballot as the result of favorable action taken by the legislature. The constitution of Michigan at present authorizes the state, under the heading of internal improvements, to participate only in highway and reforestation projects. Passage of the amendment measure is of vital importance to the extensive airways construction program mapped out by the State Board



TRAIN WITH VON HOFFMANN FOR YOUR PLACE IN AVIATION

Proof that VON HOFFMANN *Graduates are Readily Accepted*

On file in our office are many letters from graduates telling of their more ready acceptance for positions because they were Von Hoffmann trained.

Below are excerpts from two of them:

Mr. T. H. Worthington writes that he got a job as soon as he graduated. In writing about the incident he says—"Just as soon as I stated I graduated from Von Hoffmann Air College, I noticed they took more interest in me."

Mr. Richard McDougall, another graduate who is now an instructor in another school writes—"When I told them I graduated from Von Hoffmann they gave me the job."

Located on the famous $2,000,000 Lambert-St. Louis Municipal Airport

VON HOFFMAN AIR COLLEGE

440 Lambert-St. Louis Municipal Airport, St. Louis, Mo.

U. S. Department of Commerce approved School for Transport, Limited Commercial, and Private —Ground and Flying.

THEN you can be certain of your ready acceptance into this modern industry. For the type of training you get — its thoroughness and completeness are scrutinized very closely. Aviation is looking for capable men. But positions of responsibility require men who have learned every phase of each problem they will be called upon to face.

The practical training given at Von Hoffmann has proved itself repeatedly. 97% of all of our flying students pass Government tests on first trial. That is a record you cannot overlook.

The Von Hoffman Air College is one of the few schools in the country with the highest Government rating. This rating was awarded only after the Government made a careful study of our equipment, instructors, and system of training. It is your guarantee of the best training.

If you are over 16 years of age send in the coupon below and we shall send you full particulars.

VON HOFFMANN AIR COLLEGE
440 Lambert-St. Louis Municipal Airport
St. Louis, Missouri. MAIL TODAY

Name . . . . . .

Address . . . . . .

City . . . . . *State* . . . . . .

Age . . . . . *I am interested in*

☐ FLYING COURSE ☐ MECHANICS COURSE
☐ WELDING COURSE ☐ HOME STUDY

of Aeronautics, it is pointed out by Maj. Floyd E. Evans, director.

The air board's building program calls for establishment of forty intermediate fields within the next two years. All of these will be situated in the northern portions of the state. The ten-year program outlined by the board calls for some 350 to 400 fields, the result of which would be to make the northermost parts of the Upper Peninsula practically as accessible by air as the lower half of the state.

MICHIGAN has 485 planes, representing an increase over the past year of 100, it was anounced recently by Major Floyd E. Evans, director of the State Board of Aeronautics.

Grand Rapids Sponsors Air Tour

THE annual Michigan air tour will be sponsored by Grand Rapids this year, it was announced recently by the aeronautics commitee of the Grand Rapids Chamber of Commerce.

The third annual air tour will be held late in June and will probably last ten days. About seventy-five planes are expected to visit all of the principal cities in the Lower and Upper Peninsula, Grand Rapids being the starting and finishing point.

AIRPORT managers from all parts of Michigan will attend a meeting called by the State Board of Aeronautics at Detroit, April 15 during the National Aircraft show, it has been announced by Maj. Floyd Evans, director. There are fifty airport managers in the state, Major Evans stated, and the meeting will be the first of its kind to be held. The purpose will be to familiarize the managers with the air regulations and the necessity and means of enforcing them.

SOME fifty-five state legislators and twenty other aviation enthusiasts are considerably more familiar with Michigan's airports than formerly, as a result of the first legislative air tour conducted by the State Board of Aeronautics.

WISCONSIN

GEORGE S. WHYTE president of Macwhyte Company, Kenosha, Wis., manufacturers of wire rope, aircraft tie rods and other products of steel wire, has been elected president of the Wisconsin Manufacturers' Association. Mr. Whyte has previously served as president of the Kenosha Manufacturers' Association and vice president of the State Association.

[W. SCOLLARD]

Plan New Company

PLANS are under way for the formation this spring of a new aviation company at La Crosse. The company will operate a plane-taxi service, conduct an aviation school and plans to erect a modern hangar of sufficient size to house twelve to fourteen planes, including one Ford trimotor ship.

EDWARD KERSTEN has transferred his hangar and Eaglerock plane from his former airport on the lower De Pere Road to the Brown County airport at Green Bay. The move was made in an effort to concentrate the base of all aviation activities in Brown County upon one field.

THE Aircraft Sales and Service Corporation, a subsidiary of Midwest Airways, Inc., Milwaukee, has been named state and Northern Michigan distributor for the American Eaglet planes.

E. N. QUINN has resigned as president the Royal Airways Corporation, Madison, Wis. He is succeeded by Capt. Howard Morey. R. E. Cole has been named vice president of the company, and George Stang, secretary and treasurer. Both will serve as directors. Royal airport is owned by the Allied Aviation Corporation of Moline. The field was first established as a commercial airport six years ago by Howard Morey.

MINNESOTA

AN aviation class for women has been organized by Miss Florence Klingensmith. Flight instruction is given at Wold-Chamberlin Field, Minneapolis, Minn. Members of the class include the Misses Delle Lange, Marion Oakley, Dorothy Collins, Betty Dow and Frances Pryzums.

[H. A. LINDBERGH]

IN ceremonies sponsored by the St. Paul Aviation Club, Governor Floyd Olson of Minnesota will officially accept on April 11 the hangar erected by St. Paul for the 109th Aero Squadron, Minnesota National Guard. The activities will be held in the hangar at the municipal airport, during which the planes used by the 109th will be on exhibition on the field.

THE board of St. Louis County commissioners has voted $6,000 for immediate improvements to the Ely, Minn. airport. The field was deeded to the commissioners because county aid cannot be legally given to municipally owned airports.

NEBRASKA

[R. O. BENNETT]

UNION AIRWAYS COMPANY of Lincoln, of which H. E. Sidles is president, has asked the Nebraska State Railway Commission for authority to issue $150,000 of stock, for the purpose of buying equipment and airships, of which four per-cent is for promotion and survey expenses.

ARROW FLYING SCHOOL, operating at the Arrow Airport, has formed a special flying club for members of the Lincoln Junior Chamber of Commerce. Four members of the organization have enrolled for flying instruction.

PRELIMINARY plans have been completed by the Red Cloud Aviation Club of Red Cloud, Neb., for the dedication of the local airport in May. The American Legion will assist the club in preparing plans for the exercises. F. D. Henderson, an instructor of several years' experience, is forming a flying school to operate at the Red Cloud airport.

THE Lincoln Post of the American Legion held an aviation exhibit in conjunction with its annual Greater Lincoln Exposition, March 23—28.

JOHN H. AGEE, president of the Lincoln Chamber of Commerce, has announced the personnel of the chamber aviation committee as follows: E. J. Sias, president Lincoln Airplane & Flying school, chairman; Charles Stuart, Sidles Airways corporation; Charles B. Pirie, president, Arrow Aircraft & Motors corporation; Verne Hedge, former mayor and chairman of the city aviation advisory committee; D. L. Erickson, city engineer; S. Max Kier, state representative and president of the Lincoln Aero club, a chapter of the N. A. A.; and Victor H. Roos, president of the Lincoln Aircraft Company, Inc.

ILLINOIS

Edgewater Flying Club

A Spanish-American division was recently added to the facilities of the Edgewater Flying Club, Chicago, Ill., under the supervision of Capt. Ben Venegas. The new division will be in addition to the club's air university and regular flight activities.

Officers of the Edgwater Flying Club were recently elected as follows: George K. Spanier, reelected president; Alec T. Hetherington, relected treasurer; Omer Breault, vice-president; Harry Aument, secretary; and Arthur Hitzman, Emmett Gorham and Joseph Glunz, directors.

MISSOURI

ST. LOUIS

[T. P. WAGNER]

PLANS for a terminal building for Lambert-St. Louis Field, to cost $110,000, have been approved by the Municipal Airport Commission.

ORDERS for more than 200 airplanes have been received from Curtiss-Wright dealers as a result of the recent aerial fashion show held here, at which the new Curtiss line was displayed The majority of the orders are for the new "Junior."

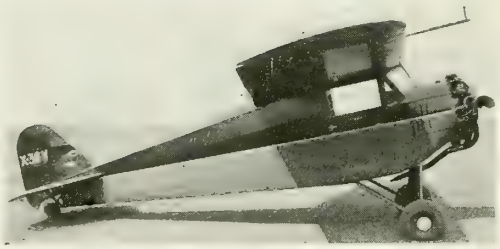
WITH the appropriation from bond issue funds of more than $100,000 to complete grading, drainage, and concreting at Lambert-St. Louis Field, the airport is qualified for an A-1-A rating under the Department of Commerce. Application for the rating has been made. Field Manager Parks is planning open house the first warm even-

A NEW ERA
IN
SMALL PLANE DESIGN



THE HUNTINGTON CHUM

With 35 h.p. Continental...$1,550
With 45 h.p. Szekely..... 1,750
With 80 h.p. Genet 1,950



THE HUNTINGTON GOVERNOR

With 110 h.p. Warner.....$5,850
With 120 h.p. Chevrolet.... 5,850
With 125 h.p. Kinner 5,850

When you have a friend with you in your car, do you place him in the rear seat, all alone? The old style tandem cockpit seating arrangement in airplane design is now passé. Even the cockpit is discarded in these ultra modern ships. Huntington engineering has achieved a new type of fuselage which permits large square cornered doors on both closed and open models, and side-by-side seating. You do not have to be an acrobat to get into and out of these craft. Safety factors are greater than required, and comfort has been stressed for both pilot and passenger, even to the point of tilt of seat cushion, height of window sill, convenient position of window winding crank, instrument lights, etc. Huntington design and engineering experience date back to the inception of American aeronautics.

Dealers will find in this line a superior product in two price classes—the slow CHUM for beginners and the 120-mile-per-hour GOVERNOR for long distance travel in rough weather, with a climb of 1,000 feet per minute.

We are jigged up to take care of a growing demand in the small plane field. We would be glad to have you come to see us by train, for perhaps you might like to return home in a good looking, easy-to-fly Huntington plane.



ANOTHER VIEW OF THE CHUM



THE GOVERNOR ON EDO PONTOONS

HUNTINGTON

AIRCRAFT CORPORATION
Stratford, Connecticut

ing in order to show off the new lighting system at the field.

THE VALLEY BIRDMEN, an organization of flying enthusiasts who own a Moth and fly for fun at Curtiss-Steinberg Airport, have established a junior branch. At a recent meeting an offer was made to admit the juvenile flyers into the club at half the fee paid by the older members. It is planned to purchase an additional ship because of increased membership.

IOWA

[R. W. MOORHEAD]

PIONEER FLYERS, INC., Mason City, Iowa, have been appointed dealer for the Curtiss-Wright Aircraft Corporation.

G. RAYMOND JONES has organized the Creston Aero Club and will have charge of instructing club members. The organization plans to purchase a two-place cabin high-wing monoplane. Members of the club include Harry Collman, Vincent Bradley, A. B. Bradley, Clifford Smith, Harlan Schmuck, O. E. Baker and Carlton Thompson.

OKLAHOMA

[F. E. SCHOFIELD]

PLANES should be landing on the new Oklahoma City municipal airport by June 1, George Brown, Oklahoma City engineer has announced, after inspecting the work. With the exception of the administration building all important features of the construction work may be completed in May.

SIX men named by the Oklahoma City Chamber of Commerce aviation committee to attend the convention of the Airport Division of the Aeronautics Branch of the Department of Commerce at Tulsa, Okla., March 25-27 are: C. E. Page, A. E. Warner, H. C. Martin, George F. Brown, Clint Johnson, and W. E. Fletcher.

A SECOND hangar is being added at the municipal airport at Stillwater, Okla., by the Garland School of Aeronautics, Tulsa. A ground course for student pilots is being conducted by Jack Huff, coöperating with the Oklahoma A. & M. College.

PUBLICATION of pamphlets containing schedules of all airlines entering Oklahoma City, covering mail, express and passenger service, will be sponsored by the Oklahoma City Chamber of Commerce Air Traffic Club. Each club member was assigned a group of firms and individuals to interview in behalf of air traffic within the next few weeks.

A STEEL airplane hangar will be constructed at Post Field, Fort Sill. Outside dimensions of the hangar are approximately 120 feet by 300 feet, and the cost of the building will be approximately $150,000.

AN average of forty persons rode airplanes out of Oklahoma City daily during February. During the month, 1,120 persons took passage on the five airlines operating out of the city.

SUPPORT of proposed legislation restricting use of unlicensed airplanes was agreed upon March 17 in Oklahoma City at a conference between Charles W. Short, Tulsa municipal airport manager, W. E. Fletcher, Oklahoma City airport manager, and A. Alcorn, representing the United States Department of Commerce.

It was pointed out at the conference that no accidents have occurred in Oklahoma among licensed planes. The proposed legislation would give airport managers authority to enforce regulations restricting use of unlicensed planes at their respective airports.

[W. H. WITT]

OKLAHOMA CITY chapter of the National Aeronautic Association was reorganized at a recent meeting. More tnan fifty Oklahoma fliers attended the meeting. Frederick Neely, Wichita, Kansas, district governor, spoke at the gathering. Clint Johnson, president of the Johnson-Bleakley Flying school, presided.

WORK was begun March 1 on the new $50,000 airport at Miami, Okla. Construction of a $9,000 all-metal hangar was the first item on the improvement of the 180 acres recently acquired by the city council for the airport.

CONTACTS

By FRANK E. SAMUELS

FOR three consecutive Sundays one of our major airports has staged a show for charity, or for the unemployed. On February 22, the Grand Central Air Terminal entertained a crowd for the benefit of the American Legion. On March 1, the United Airport donated the entire receipts for auto parking and passenger flying to the American Red Cross, for the relief of the drought suffers. On March 8, the Los Angeles Municipal Airport at Inglewood, staged a show, second to none, and devoted the receipts to the unemployed of this territory.

Credit enough cannot be given to the pilots who donated their services to make the three shows the success that they were, nor to the plane owners who furnished their ships for passenger flying.

The list of pilots who participated at the three shows included Col. Arthur Goebel, Col. Roscoe Turner, Tex Rankin, Mrs. Florence "Pauncho" Barns, Dorothy Hester, Frank Clark and Frank Tomac, Major Carl Spatz, *Question Mark* fame; I. A. "Woody" Woodring, Earl Ovington, Major Moseley, Dudley Steele, Vance Breese, Wallace Beery, Lieutenant Ogden, and innumerable Army, Navy and commercial pilots. So many, in fact, I have not mentioned, that I probably will be a long time squaring myself with the fraternity.

Joe Nikrent, official timer of the N. A. A., donated his services for the three shows, as did Capt. Walter Parkin, chief of the Department of Commerce force of this territory, who with one of his assistants approved each event, before and after it was run. Air races, parachute landings, stunting, band and orchestra concerts entertained the crowds that attended each of the three shows.



High-wing monoplane built by Emsco Aircraft Corporation of Downey, Calif., for Prince Jean Ghica, Air Minister of Roumania

PERFECT BALANCE OF PLANES AND PRICE BRING THE BUSINESS TO CURTISS-WRIGHT



Curtiss-Wright eight place "Kingbird" Transport powered with two Wright "Whirlwind 300's." High speed 142 m.p.h., cruising speed 122 m.p.h., range 450 miles, ceiling 15,500 feet.

U. S. Navy Curtiss-Wright "Hell Diver" powered with a Wright "Cyclone 575." Also built as an executive transport, two place, with speed of 184 m.p.h.



See Curtiss-Wright's fleet for 1931 described in this issue . . . a complete line under one name . . . seven new models sleek in design, ruggedly built, simple to operate, easy to service . . . manufactured by the leading supplier of military planes and engines to the U. S. Military Services. The sale and distribution of these planes, engines and all types of aeronautical equipment, is conducted in foreign countries by—

CURTISS-WRIGHT EXPORT CORPORATION

27 WEST 57TH STREET, NEW YORK, N. Y., U. S. A.
CABLE ADDRESS "AEROEXCO"

ON March 15, the Western division of Transcontinental and Western Air moved its base of operations from its Alhambra airport to the Grand Central Air Terminal in Glendale, at which time many changes in the personnel of this division went into effect. Clifford Mutchell was appointed assistant to Jack Frye, vice president in charge of operations; Paul E. Richter, Jr., formerly general manager of Aero Corporation, division superintendent, with L. W. Goss as his assistant; Herbert Hoover, Jr., communications engineer, with J. C. Franklin remaining as his asistant; Walter A. Hamilton, superintendent of maintenance and plane and engine overhauling. A number of minor personnel changes also went into effect in the different departments.

THE Aero Brokerage Service Company of Los Angeles Airport, Inglewood, California, announces the following recent sales of aircraft: OX-5 Travel Air to Harry A. Michael of Los Angeles, Calif., J-6-9 Travel Air monoplane to D. Flynn of Spokane, Wash:; Le Blond Aeromarine Klemm to Kenneth and M. J. Brooks of Alhambra Calif.; OX-5 Travel Air to Norman K. Hawkins of Los Angeles, Calif.; Axelson Travel Air to W. A. Hunt of Fresno, Calif.; J-6-7 Travel Air biplane to Morey C. Cope of Santa Cruz, Calif.; J-5 Eaglerock less motor to Penfield Bros. of Modesto, Calif.; J-5 Stearman to Dr. Franklin E. Cutler of San Diego, Calif.; and Kinner Fleet to Los Argles Aircraft, Ltd., of Inglewood, Calif.

CALIFORNIA

P. A. T. Acquires West Coast Airline

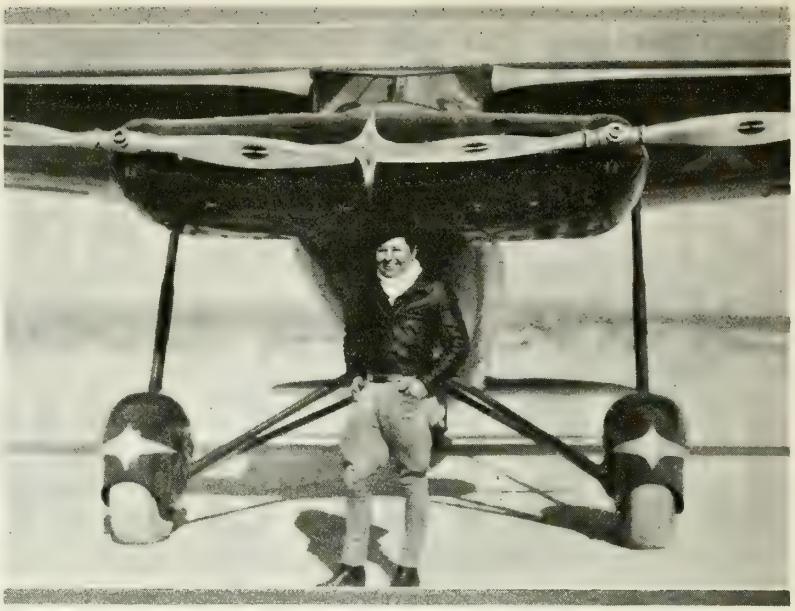
PACIFIC AIR TRANSPORT has purchased equipment of West Coast Air Transport which, on March 16, retired from the San Francisco-Seattle run, where it was a competitor of Pacific Air Transport of Boeing System. The company becomes the only operator on this route.

Pacific Air Transport has started a daily trimotor daylight passenger plane service between Seattle, Tacoma, Portland and San Francisco. This is supplemental to its overnight air mail-passenger service between Seattle and San Diego.

A seven-hour flight between Seattle and San Francisco and a five-hour flight between Portland and San Francisco is effective. The planes carry ten passengers and two pilots.

With inauguration of the new daylight trimotor passenger service between Seattle and San Francisco, Pacific Air Transport's daily mileage increase from 2,476 to 3,492 miles.

BOEING AIR TRANSPORT has forty planes, including twelve trimotors, all equipped with Hornet engines, except two planes provided with Wasps. Average flying is 7,700 miles per day, forty per cent of this amount during darkness. Forty landings and take-offs a day are made.



Olympic twin-engined cabin monoplane developed by Loughead brothers

Test "Olympic" Twin-Engined Cabin 250-Horsepower Monoplane

TEST flight of the "Olympic" twin-engined cabin monoplane designed by Allan H. Loughead and built by Loughead Brothers Aircraft Corporation, were made March 18 at Murdock Dry Lake. The ship was piloted by E. L. Remelin, pilot-engineer of the Loughead company.

The Olympic is designed to operate on one engine and to have a low operating and maintenance cost. The ship is powered with two 125-horsepower Menasco C-4 engines. Engine mounting is the Loughead twin-motored arrangement which is streamlined and designed to reduce head resistance to a minimum.

Allan Loughead, president of the company, is associated with his brother, Malcolm Loughead. They designed and built the Lockheed Vega monoplane.

Boeing Employs Stewardesses

WOMEN are being employed regularly as stewardesses on Boeing System's Chicago-San Francisco passenger transports and the company reports that the public's reaction to this service has been favorable during the six months' trial period recently completed.

The ten young women who serve instead of male couriers are institutionally trained and are between the ages of twenty-one and twenty-seven. They fly an average of fourteen trips of 1,000 miles each per month. The staff was chosen from 200 applicants. Stewardesses handle tickets, serve lunches, supply reading and writing material, keep passengers informed on points of interest, and supply pillows and blankets to travelers on the night flights.

THE Boeing company uses extensively the electric arc in which it pioneered. Two types of equipment have been utilized, one a low voltage, low amperage alternating current set designed and developed by Boeing engineers; the other a direct connected motor-driven direct current unit of commercial design.

ALAMEDA

[H. V. WALDORF]

Sets Gliding Record

FLYING a Bowlus sailplane, Ray Stafford of the Dragon Fly club of San Francisco soared over Salada Beach for 47.5 minutes March 8 to set a Northern California soaring record. On the flight, Stafford covered sixteen miles and climbed to 200 feet above his starting point.

DEDICATION of the extension to the main hangar at San Francisco Bay Airdrome, which increases the structure's length to 600 feet, was scheduled for March 23. The dedication program was to be under the auspices of the Oakland chapter, National Aeronautic Association.

THE San Francisco Junior Chamber of Commerce has launched a state-wide campaign for the purchase of an official plane for Governor James Rolph, Jr.

Air Freight Company Active

FREIGHT is being transported by air between the Pacific Northwest and the San Francisco Bay region by the recently inaugurated service of the Western Pacific Air Freighters.

A special "pick up" service is operated for the ground transportation of the shipments.

A Ford trimotor is the flagship of the company's service. Monte H. Lukov of Reno is president and general manager. Charles Rector and Ray Moore are pilots.

The service specializes in transporting perishable goods. Flights are made at an

SOUTHERN AIRWAYS SCHOOLS

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altitude of in excess of 10,000 feet to eliminate the necessity of refrigeration.

OAKLAND

[H. V. WALDORF]

IN a test flight of a Lockheed low-wing monoplane, fitted with a retractable landing gear and powered with a Wasp engine, Vance Breese flew from Oakland Municipal Airport to Burbank, an airline distance of 360 miles, in ninety-two minutes. The flight, made March 5, was officially checked by observers at the two airports. Breese was accompanied by John Henry Mears.

A TOTAL of 263 persons is employed by commercial aviation concerns at Oakland Municipal Airport, according to a survey by the Board of Port Commissioners. The municipal staff, not included in this figure, totals twelve.

THE FEBRUARY operations report of the Oakland municipal airport, included the following: Landings other than students, 2,064; student, 5,219; transport planes, inbound, 159; outbound, 157; transient planes, inbound, 139; outbound, 128; passengers, transport inbound, 114; transport outbound, 135; transient inbound, 132; transient outbound, 119; tax, 1,598, total 2,098; students enrolled, 344, stamp sales, $405.18.

A GROUND school course with classes three evenings a week has been added by the Monarch Flying Service at Oakland Municipal Airport. Dolores Guinther is president and general manager. Kenney Neese, former air mail pilot, is in charge of the ground school.

A SEAPLANE ramp, measuring 12 feet by 160 feet, is under construction at the head of the Oakland Municipal Airport channel. It is to be used by naval and other seaplanes operating to and from the airport.

UTAH

[G. PERRINS]

A BILL intended to give cities power to construct airports or landing fields within and without their municipal boundaries is being considered by the Utah State Legislators.

CO-EDS at the University of Utah are gliding fans with fifteen of the girls under the leadership of Eleanore McAllister registered for the gliding course. They plan to build their own ships. There is a men's glider club at the university, using two ships built by members.

A STRIP of land containing 160 acres on Promontory Point, southwest of Ogden, has been set aside as an emergency landing field for airplanes, Eli F. Taylor, register of the Federal land office has announced.

A NEW revolving beacon, equipped with two 4,000,000-candlepower lights, has been installed at the municipal airport, Salt Lake City, Utah.

Other installations at the airfield include four new flood lights, two of which are on the hangars and the others are out on the field. The new equipment is now in use.

VERNE G. HALLIDAY has been appointed temporary manager of Airport Salt Lake to succeed Gilbert Rich, resigned.

WASHINGTON

[C. M. LITTELJOHN]

HOW Walla Walla, Wash., derives extra revenue from unused portions of its airport may be of interest to airport managers and municipalities elsewhere. The city commissioners of the Northwest center have approved a five-year lease to Roy E. Frazier for portions of the airport not needed for airplane operations. Frazier will plant these sections in wheat and alfalfa, and the city will receive two-fifths of the wheat crop as its rental fee.

THE Redmon Air Service Corporation of Yakima, Wash., recently changed its name to the Redmon-Skinner Air Service, Inc.

CURTIS L. HILL has been named as chairman of the aeronautics committee of the Tacoma, Wash., Chamber of Commerce.

GROUND school instruction in the theory of flight, as well as in airplane structure and rigging, has been launched at the training school of the Washington Aircraft and Transport Corporation. N. D. Showalter supervises the instruction three evenings a week.

THE Neophyte Aviation Club, recently organized in Seattle to promote aviation in the Northwest, elected officers at its first regular meeting. Douglas Miller was named president and Gilbert Cook, secretary.

A HANGAR costing $75,000 will be built at the municipal airport, Seattle, Wash., and leased to the Federal Government. King County commissioners have issued orders for the immediate construction of the large shelter for Government planes.

A BUILDING program involving $100,000 for Felts Field, municipal airport at Spokane, Wash., has been proposed, to commence this summer. These plans for extensive improvements at the port were presented to the city council of that city recently in the form of application for an exclusive ground lease on the south side of the airport east of the Air Corps hangars. An area with 3,300 feet frontage and 100 feet deep is sought for the improvements.

IDAHO

[I. M. DURNIN]

WITH completion of the addition to the hangar, Ritchey Field, four planes may now be accommodated, it was announced at the meeting of the Nampa, Idaho, council recently.

The mayor and council approved a lease agreement between F. H. Christenson and the City of Nampa for hangar space and the exclusive right to establish a flying school and to install gasoline and oil equipment for the use of transient fliers.

THE HADDOCK FLYING SERVICE has been making regular passenger, freight and mail trips from Cascade over the snowy mountains to Knox, Yellow Pine and Stibnite. In addition, William Gowen, pilot, makes special trips to any interior point where it is possible to land and take off.

With the exception of the Cascade field, all the landing spots are located in rugged canyons from five to seven thousand feet above sea level and for more than six months of the year covered with snow. The plane is ski-equipepd.

TEXAS

DEVELOPMENT of a seventy-two-acre airport one mile northeast of Wharton, Texas, has been practically completed by G. C. Gifford. It is planned to open the field this month, dedicatory ceremonies being scheduled on or about April 15.

LOUISIANA

[C. F. COCK]

ORGANIZATION of the Shreveport Aero Club was started in March by a group of aviation enthusiasts under the direction of F. A. Dick, who will be instructor. The membership will be limited to fifteen.

A TRIP over the American Airways line from Shreveport to Los Angeles was made in March by Mayor James G. Palmer, of Shreveport, to observe methods of operating airports along the route. His inspection was made in anticipation of the opening of the municipal airport at Shreveport.

INSTALLATION of the Federal radio station at Shreveport has been started and is expected to be completed within the next few months. A smaller station is in operation at Texaco Airport for the benefit of regular airlines operating in the vicinity of Shreveport. This station will be removed to the municipal airport during the summer.

New Airplane Company Formed

TO OPERATE a flying school and general airplane service, William Fliers, Inc., has been organized at Sarasota, Fla. The company will erect a hangar and administration building. General facilities at the airport will be improved. The officers of the company are: Fred J. Williams, president; Truman Fassett; and Loring Raoul, secretary-treasurer.

INCLUDED in the uses of Fibre-Tite cornstalk plastic is the streamlining of aircraft, according to a recent report issued by the Fibre-Tite Company, Ames, Iowa, manufacturers. This product is a compound of the consistency of putty, which hardens on exposure to the air, and can be planed, tooled, cut, sawed and polished.

ARMY AND NAVY SURPLUS GOODS

Purchased at such ridiculously low prices that we can re-offer them to the trade at real bargain prices. Buy now.

FLYING SUITS



Fur-lined, electrically heated. Government olive drab waterproof cloth. Finest workmanship. Fur-lined throughout. Unused. Regular value over $200. Our special price . . . **$35.00**

Fur-lined, government reclaimed army suits. Outer shell of heavy olive drab cloth, lined with fur throughout. Fur collar. Adustable button legs and wrists, belt, breast and back pockets. Sizes 36 to 42 . . **$16.00**

Blanket-lined winter flying suit, or for high altitude summer flying. Warm and comfortable. High grade olive drab cloth and a thick heavy blanket lining. Large roomy French pockets at the sides and a handy breast pocket for carrying maps, etc. Adjustable neck, collar and legs. Regular value $30. Reclaimed **$7.00**

HELMETS



Leather, Army No. 101, caracul fur-lined, ear shields, chin strap and hookless fastener. Sizes 7 to 7½. No. 102, French black leather, winter fur-lined helmet, ear shields, chin strap and snap fastener, sizes 1-2-3. No. 103, Army and Navy old official chocolate brown leather helmet. Worth over $10.00 . . . . . **$1.95**

Complete line of Army and Navy goods: clothing, shirts, breeches, tents, tarpaulins, hospital supplies, electrical signal equipment, etc. Write for our catalog.

Special discount for dealers. 30 per cent deposit, balance C. O. D. Subject to prior sale.

ENGLISH IMPORTED BEDFORD CORD BREECHES

Genuine Government, extra high quality

English cut: nothing more serviceable or dressy. For flying, riding, military or ordinary wear, as a pair of breeches with high boots. Olive drab color. Wool.

No. 301—Leather leg reinforcement. Button bottoms.

No. 302—Plain leg. Lace bottoms.

No. 301—Leather leg—reinforced. Sizes and lengths:
Size waist—32, 33, 34, 35.
Length—23 to 29, inclusive.

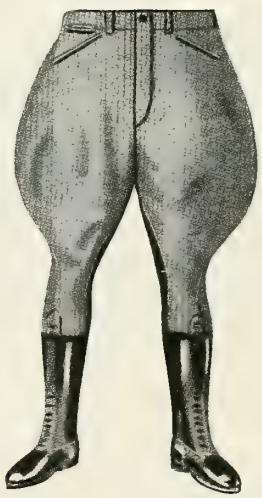
No. 302—Plain leg—Lace bottoms. Sizes and lengths:
Size waist—leg length from crotch to ankle
31—31 x 23½
32—32 x 24
33—33 x 23 or 23½, 33 x 25, 33 x 25½ or 27
33—33 x 29 or 29½
34—34 x 24, 34 x 28, or 30
35—35 x 23, 35 x 23½, 35 x 27½ or 28

These breeches were purchased from the government at a bargain. We, in turn, can now offer them to the trade at a low price.

Regular values $15.00 to $20.00 a pair

No. 301—Leather leg reinforced, $6.00 a pair

No. 302—Plain leg, $5.00 a pair



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NEW AERONAUTICAL BOOKS

Reviewed by STEPHEN A. McCLELLAN, B.Sc.

ZOOM
By GEORGE R. WHITE

ALTHOUGH the English language has been spoken for a good many years new primers regarding it appear periodically. Since aviation has still to achieve the general acceptance accorded the English language in this country there is probably a real need for the recent flood of primers on flying.

A primer on flying is truly a poser to compose. So many things are interdependent and so frequently several things have to be done simultaneously that orderly and complete presentation is apt to be voluminous and boring. Unless allegory is resorted to there is no middle ground between the concise "cut and dried" style and the rambling "buffet supper" type. *Zoom* falls in the latter category.

MURDER IN THE AIR
By DARWIN L. TEILHET

A GOOD detective story with plenty of action, based on the disappearance of a man from a plane in flight. Aircraft do not figure prominently in the story, but when they are referred to, there is no exaggeration or misleading detail.

The author frankly admits that the disappearance of the Belgian financier, Lowenstein, while flying across the English Channel inspired the plot. In view of the fact that Lowenstein's fate is still a mystery the possibility which Teilhet's yarn demonstrates is of added interest. One's credulity is only taxed in regard to the fortunate location of a hay stack. We recommend it to those in search of light reading, particularly the crime addicts.

AVIGATION
By BRADLEY JONES

WE have always liked the term "avigation." It is terse and yet completely descriptive. There is little chance of a stranger getting from it any meaning other than, "the known arts of navigation applied to aircraft and modified to suit their particular operating conditions."

Bradley Jones has produced a book in keeping with its title. The text is clear, complete and logically arranged. Further, it is brief and unencumbered with scholarly details or irrelevant subjects. Meteorolgy, for example, is discussed only sufficiently to give fundamental definitions and the proper consideration of the weather for long flights. The balance of the long and vital story is left for the meteorologist to tell in some other volume.

Avigation is compact in size, in spite of broad scope of contents.

ALUMINUM IN AIRCRAFT
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AT LAST we have found a book with an all-inclusive title which is not a disappointment when read. The characteristics of aluminum and aluminum alloys, aircraft metallurgy, the application of aluminum alloys, manipulation and shop practices, corrosion and its prevention, inspection, maintenance and repair are discussed completely but briefly. That does not leave much of the subject uncovered.

Every mode of usage is illustrated with examples from the current parctice of the builders of propellers, engines, pontoons, flying boats, landplanes, dirigibles and numberless minor accessories. The text is illustrated and well indexed by subject. Complete tables of commercial forms, sizes and specifications are included.

AERONAUTICAL METEOROLOGY
By WILLIS RAY GREGG

A GOOD pilot like a good sailor must be able to make a reasonable forecast of the weather both from weather maps and from watching the external indications. This can be done only by having a knowledge of the fundamentals that govern various weather conditions.

In *Aeronautical Meteorology,* Mr. Gregg covers the subject in great detail. However, those who do not wish to delve into the niceties that concern the professional weather prophet will have little trouble in finding the high lights they are seeking. The author is to be commended for pointing out a number of phenomena of air flow and cloud formation that are of great importance to the flying man.

AIRMANSHIP
By JOHN McDONOUGH

THIS book confines itself specifically to training on one type of machine which is not particularly common in this country. The book contains a number of excellent practical pointers for the beginner and for the individual going off into the north country of Canada for the first time.

AIRPORT PROBLEMS
By AUSTIN F. McDONALD

A VERY comprehensive treatise of all the broad phases of the airport problem without inclusion of detail or technicalities.

TRADE LITERATURE
NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

Booklet on Northrop Alpha

DEVOTED to the Northrop Alpha, an all-metal, low-wing, six-passenger cabin monoplane, a booklet was recently issued by the Northrop Aircraft Corporation, Burbank, Calif. Details of design and construction, performance and purposes of the Northrop Alpha are given. The text is illustrated with photographs and drawings.

Pioneer Instruments Catalog

PUBLICATION of the "Pioneer and Consolidated Marine Instrument Catalog" was announced recently by the Pioneer Instrument Company, Brooklyn, N. Y.

Aviation Accounting System

DESIGNED by L. L. Putnam, C. P. A., a leaflet on aviation accounting records, which describes a system intended primarily for aeronautical companies, has been announced by Tallman, Robbins & Company, Chicago, Ill., manufacturers of loose leaf equipment for accounting purposes.

Service of the Boeing System

SERVICE which the airlines of The Boeing System offer the air traveler is described in "Across the Skyways With Boeing System," a booklet recently published by the Boeing company. Contents include routes and schedules, equipment and general facilities, organization and personnel.

Westinghouse Engineering

A BOOKLET, "Engineering Achievements, 1930," was recently issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Taft-Peirce Tool Room Specialties

PRODUCTION and inspection tools made by the Taft-Peirce Manufacturing Company, Woonsocket, R. I., are described and illustrated in a pamphlet, "Tool Room Specialties," recently issued by the company.

Automatic Arc Welding

FEATURING automatic arc welding, a publication entitled, "Automatic Arc Welding Data Bulletin No. 14," has been issued by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Williams Socket Wrenches

THE LINE of detachable socket wrenches made by J. H. Williams & Company, Buffalo, N. Y., for aviation and general industrial needs, are illustrated and described in a pamphlet recently issued by the company.

New Standards Data

A NEW compilation of data entitled, "Measurement Units and Standards," has been issued by the American Institute of Weights and Measures, New York City.

Standard Reference Fuels

FIVE curve sheets giving the calibration of Standard Reference Fuels "A" and "B" when blended with Tetra-Ethyl lead, benzene and each other respectively, in terms of Octane Numbers as calibrated in the laboratory of the Standard Oil Development Company, Bayonne, N. J., are contained in a pamphlet recently published by the company.

Uses of Cotton Fabrics

A SURVEY of the different types of cotton fabrics manufactured, the uses of each fabric and the uses of cotton by the various industries are discussed in "Cotton Fabrics and Their Uses," a pamphlet issued by the U. S. Department of Commerce.

JUNIOR ACTIVITIES

(*Continued from page 221*)

lower than the average. The hub is tapered so that the tube is streamlined. A 1/16 inch shaft is rigidly secured to the propeller.

Powerplant

Fifteen strands of ⅛ inch flat rubber strands constitute the powerplant. The strands are lubricated with glycerine and are strung onto the hooks so that there is not a great amount of slack.

General Points in Design

Originally the Torpille had a landing gear all in one piece, as shown in the photograph. This was done in an effort to reduce resistance to a minimum and it certainly does look racy. However, a point of design had been overlooked, for the tail wheel on a long bamboo splint was very springy and in taking off the model would pitch badly. For that reason it was changed to the design shown in the drawing.

While we are discussing questions of design, we should not lose sight of the fact that sometimes a streamline form can have a greater resistance than the part it is replacing. For example, a simple landing gear made of round wire will have a certain resistance. We might wish to reduce this resistance and substitute a streamline shape, but considerably larger in "frontal area" (the area when viewed from the front). Roughly, the ratio of resistance of various shapes as compared to a flat disc is as follows:

Disc	30
Wire	29
Sphere	10
Blunt Streamline Strut	.04
Dirigible shape	.01

In other words, we could have a blunt streamline strut about seven times as large in frontal area before its resistance equalled that of a wire. If we exceeded this area, we would actually be *increasing* our resistance by changing to the streamline shape. A good model designer watches points like this.

Performance

It would be rather difficult to classify this model. It is not a distance flier, floater, nor racer. We might call it a sort of every-day, general utility type. It flies at a high speed, not because of its racy lines, but because of its high wing loading. As a result, it is quite independent of rough weather conditions. I have personally witnessed several flights by this model, and it seems to take off readily. The climb is rather slow so that no great altitude is attained. Its stability is quite good, but it would seem that in view of a slight tendency to side slip on turns, a pair of fins above the C.G. might be added.

It may be said that Torpille is an extremely interesting flier, both neat and attractive, and if it were built up of balsa instead of spruce and basswood, its weight might be kept down to about 1½ to two ounces. This would reduce the wing loading to about one-quarter of the present 4.61 ounces per square foot, or we might say 1.2 ounces per square foot, which would bring it into the class of the "Giant Chickadee" (February AERO DIGEST). With this loading, the Torpille should have a power duration of many minutes. Why not tackle it?

Review Questions

When might a streamline shape offer more resistance than one not streamlined?

What is frontal area?

What approximate ratio of resistance exists between a flat disc and a dirigible shape of the same frontal area?

Why is resistance so important?

PERSONAIRLITIES

(*Continued from page 64*)

If a vessel is stranded on some of the ever-shifting sand reefs, which happens quite frequently, it can be most certain of being attacked by bandits if it is not heavily armed.

"I know of a Norwegian merchant vessel of some 4,000 tons, the *Botnia,* that ran aground near Nanking. The bandits captured the captain and chief officer and held them for ransom. They managed to escape after about two weeks' confinement. And how the bandits would like to get their hands on us. They fired at us time and again even while in flight. If we sat down for bad weather or other reasons they rushed for us as fast as they could manage. We always fooled them, though, by either taking off or taxying away from them. This, of course, only happened away from any town or village. In the treaty ports or ports of call everything was well policed."

Nothing monotonous about a forced landing in a Chinese river. Fortunately for Johnsen, the Loening could taxi faster than a boat could move. He told me that many times while they were down in a fog they were fired upon—in fact, they were in as much danger from these Chinese bandits as American yachtsmen are from the official bandits who infest our harbors under the protection of their patron saint, Volstead.

Here are some of Johnsen's notes on dead Chinamen—you'd like to know something about dead Chinamen, wouldn't you? You wouldn't? All right, then, I'll print it:

"When a Chinaman dies, his body is embalmed, placed in a coffin wrapped in straw and matting and placed on top of the ground, any place, even a vacant lot in the cities. Wealthier Chinese build a little brick house (with ventilating windows) over the coffin. This must stay exposed for two years. After that period, dirt is piled over the remains. The wealthier they are, the more dirt is gathered. In some places one can see a regular hill built over the dead. Under no circumstances must these burial places be disturbed, so China's agricultural land is becoming smaller and smaller. Flying inland over China leads one to believe it's nothing but a great big grave yard."

I imagine it must be something like looking down from the Senate gallery at the dead ones on the floor. Practically the only difference is that they're not covered up with dirt.

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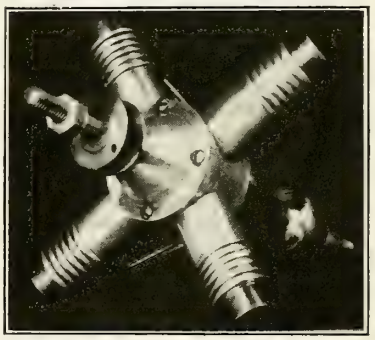
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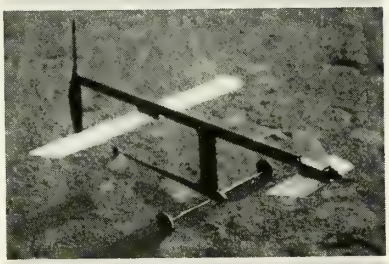
WATKINS' "TORPILLE"

CAREFUL STREAMLINES GIVE GOOD PERFORMANCE

By R. E. Dowd

ONE of the finest examples of streamlining that has made its appearance in the model field is Watkins' "Torpille." The powerplant is housed in a neat round wooden tube, and the planes are attached by dress snaps to simple wood "plane hangers." The landing gear struts are of hollow streamline section wood, and the main wheels are rubber tired. The model gives one the impression of being carefully planned and equally carefully constructed. Because head resistance is reduced to a minimum, this little flier will take off with only .72 ounces of rubber in spite of the fact that the loading per square foot of supporting surface is as high as 4.61 ounces. This is only about 10 per cent of the total weight of the model, making the "Torpille" better in this respect than any other model examined to date.

In the air the speed is noticeably high, and the flight path unusually straight and direct. Although its designer and builder, Mr. Frederick Watkins, advises that this model has not been so extensively tested as some of his other models, still it has given a good account of itself to date.



Watkins' Torpille, orginal form

Fuselage

As mentioned before, the fuselage is tubular, being formed of 1/32 inch thick basswood veneer. The inside diameter is ⅞ inch, and the seam is an ordinary chamfered lap seam about ¼ inch wide. Reinforcing plugs are cemented in either end of the tube. These plugs are ½ inch long and have a 7/16 inch square hole located centrally in them to receive the end blocks. The front or nose block, as it is called, is streamlined in shape and measures ¾ inch long plus the ½ inch of square shank, which fits into the reinforcement. A 1/16 inch diameter wire hook is inserted to anchor the rubber motor. The outer end is looped back into the block, the eye so formed providing a convenient attachment for the winder hook. The rear block mounts the propeller shaft bearing which is a piece of 1/16 inch I. D. by ⅛ inch O. D. brass tubing ¾ inch long, to which a ¼ inch diameter brass washer is soldered to act as a flange. The block itself has the same size shank as the front block, but the protruding part is merely a 3/16 inch thick flange of the same diameter as the outside diameter of the tube.

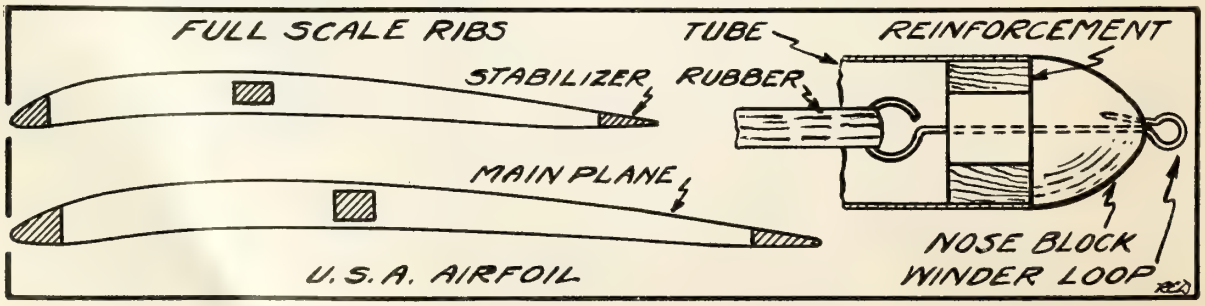
Plane

The main plane, which is double surfaced, actually has three spruce spars; one at the leading edge; one 2⅛ inches back from the leading edge; and the third at the trailing edge. Considered in this manner, the leading edge is 5/16 inch wide by the shape of the airfoil, which is U. S. A.-5. It is uniform throughout. The second spar is 3/16 inch deep by ¼ inch wide, and the third or trailing edge is 7/16 inch wide by the shape of the wing curve. The ribs are 1/32 inch thick basswood and are cut accurately to U. S. A.-5 shape. The second spar slips snugly through holes cut in the ribs and is cemented in place. The leading and trailing edges are simply butted against the ends of the ribs and carefully cemented in place. This form of construction might seem lacking in strength, but experience has proved it to be both rugged and thoroughly practical. The wing ends are of the usual bamboo, bent to the required curves. The section of these ends is about 1/16 inch deep by 5/32 inch wide.

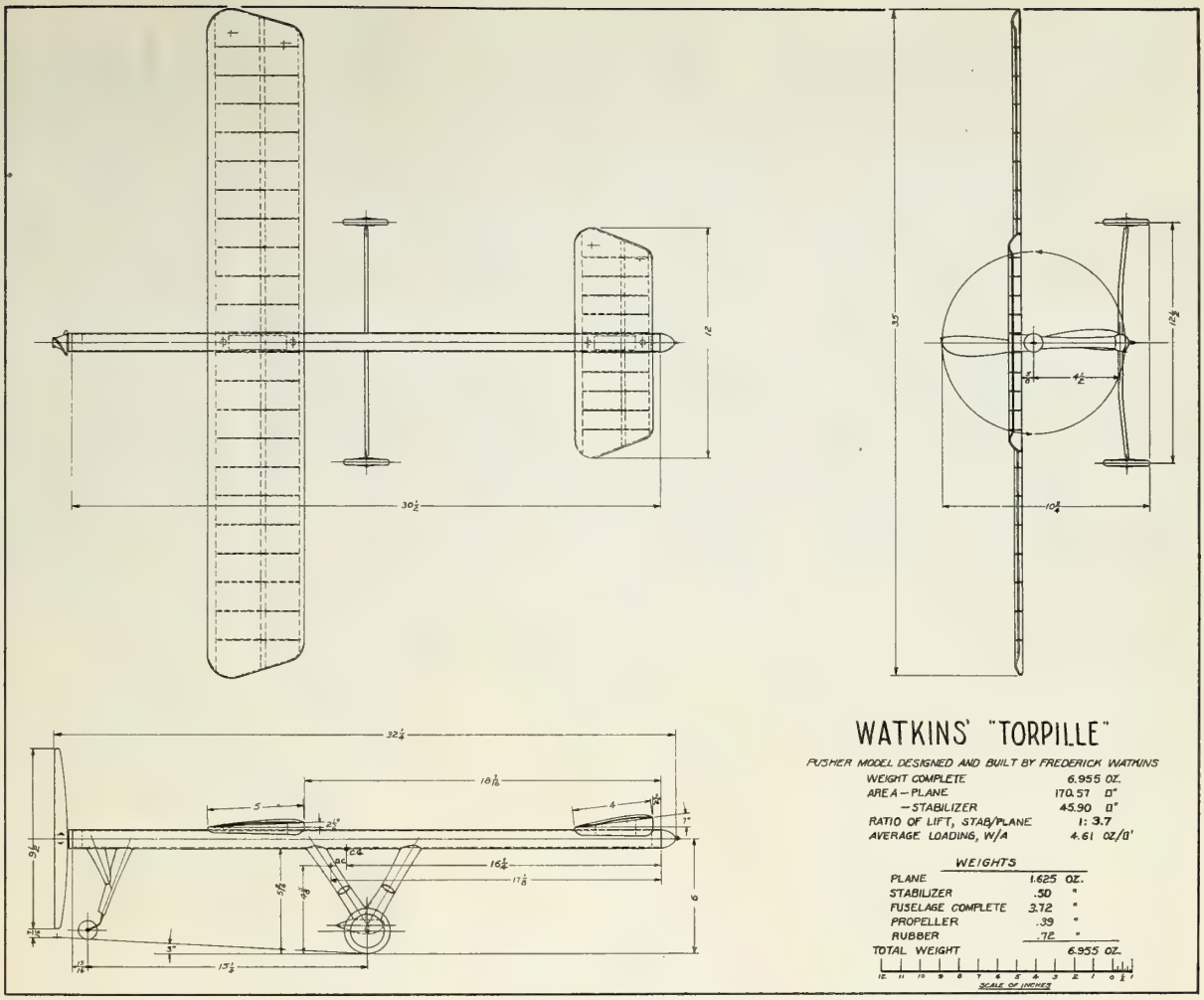
The finished frame is double surfaced with Japanese paper doped on with "banana oil." Although this plane may seem slightly heavy, it must be remembered that it was designed for relatively high speed, which means fast landings and consequently rough treatment. The finished plane is mounted with two large size dress snaps on a hollowed-out spruce plane hanger as shown on the drawing. The angle of incidence of the plane is 2½ degrees with the fuselage.

Stabilizer

The construction and mounting of the stabilizer are identical to that just described; it will therefore be necessary merely to give the dimensions of the various parts, which are as follows: Leading edge ¼ inch wide; spar ¼ inch by ⅛ inch; trailing edge ⅜ inch wide; bamboo tips 1/16 inch by ⅜ inch wide; mounting block cut for incidence an-



Full-scale drawings of the nose block and ribs for main wing and stabilizer of Watkins' Torpille



gle of seven degrees with fuselage.

Fins

No fins were provided in the original design. From a study of the location of the D. C., or directional center, it appears that the addition of keel or fin surface *above* the C. G. would improve its stability. The photograph shows such a front fin, which was experimentally used. It was found unsatisfactory because it moved the D. C. too far forward. A similar fin in the rear would correct this.

Landing Gear

The landing gear is decidedly unique in both design and construction. As has been noted on the drawing, the center of gravity is located slightly to the rear of the main wheels. This means that the greater part of the weight is supported by these wheels, and consequently in assuming its flight attitude during the take-off, the model seems to pivot about the main axle. The main struts are made hollow of 1/32 inch thick basswood veneer. The two sides composing each strut are formed roughly to shape after immersion in hot water and then when dry are carefully fitted and cemented together. A removable form is employed to prevent crushing when the sides are clamped together by wrapping with rubber strands during the cementing operation. At the apex of the Vee formed by the two main struts, a solid streamline block of white pine is fitted. If this block is properly assembled in position, the resulting triangle formed by the fuselage and the two struts will be found rigid and firm. A 1/4 inch square hole is mortised through the streamlined block, and a tight fitting aluminum sleeve made from .010 sheet aluminum is pressed in position. This sleeve receives the removable bamboo axle bar. The center portion of this bar is formed square for a distance of one inch. This part fits snugly into the aluminum sleeve mentioned. From the center the bar is tapered to 3-16 inch wide by 1/8 inch thick. Wrapped to the ends with thread are the 1/16 inch diameter stub axles, which mount the 2 3/8 inch diameter rubber tired wheels. The wheels are retained on the axles by small wire pins inserted in holes drilled in the ends of the axles. By withdrawing one of these pins, a wheel may be removed and then, on withdrawing the locking pin, which is inserted through the axle bar and sleeve at the center, the axle bar itself may be withdrawn. A little study of this method will convince one of its originality and practicability. The whole operation can be done in a few seconds, and then by removing the planes, which are attached with dress snaps, the whole model may be compactly boxed in a flat container for transportation.

The rear wheel is mounted on a support which is of the same hollow construction as the main support. The proportion of the members is clearly shown on the drawing. This wheel, like the main wheels, is turned from a piece of white pine, and is bushed with a piece of brass tubing. It differs from the main wheels in that no groove is provided for a tire. A 1/32 inch diameter wire, thread wrapped to the support and bent in the form of a fork provides the required mounting.

Propeller

The propeller is rather conventional, being carved from a white pine plank 3/4 inch thick by one inch maximum width. The leading edge of the blades is slightly swept back, as shown on the side view of the drawing. The pitch works out approximately 12 inches, which would give us a pitch diameter ratio of about 1.26. This figure is rather ordinary — or if anything, a little

(*Continued on page 219*)

FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST'S correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

ENGLAND

Schneider Trophy Race

WITH England's participation assured by the offer of Lady Houston to withstand the expenses incurred by the British government in entering planes and personnel, the Schneider Trophy Race will be held on September 12 over the Solent, between the Isle of Wight and Southampton. Royal Air Force pilots with six-mile-a-minute planes will compete against France and England. The lists closed December 12 without an entry having been made by the United States.

Great Britain, twice winner, will bid for permanent possession of the Trophy. Severist competition is expected from Italy. Little is known of the prospects of France.

British Air Budget

OFFICIAL figures made public on March 6 show that estimates for the 1931 air service budget, totaling $87,966,000, exceed by $1,215,000 the air budget for 1930. Great Britain's army estimates for 1931, totaling $194,060,000, are the lowest since 1922 and represent a decrease of $2,770,000 from the estimates for 1930.

Near East Aerial Survey

AN aerial survey expedition recently left London to explore 4,000 square miles of remote territory beyond the Karakoram Mountains in Eastern Turkestan. The objects of the expedition are to prove the possibility of improving transport facilities eastward from Eastern Turkestan, to create a channel for trade through India and to discover new areas which may be developed. A Vickers-Victrix capable of carrying a load of two and one-half tons will be used on the expedition.

Aerial operation will be carried out in conjunction with motor trucks, one of which will carry dark-room photographic equipment and another which will contain facilities for repairing the airplane.

London-Paris Flight Record

COMDR. Glen Kidston recently flew the distance of 210 miles from London to Paris in one hour and twelve minutes at an average speed of 175 miles per hour, a new record for this flight. He used a Lockheed Vega monoplane purchased recently from the Detroit Aircraft Corporation, Detroit, Mich., U. S. A.

Open North African Division of Projected London-Cape Town Airline

INAUGURATING the North African division of the projected route of Imperial Airways from London to Cape Town, South Africa, the first plane took off from Cairo, Egypt, for Mwanza, March 6. For the present, air service between London and Mwanza will be maintained. The route is to be extended to Cape Town this summer.

The first plane on the North African division carried two pilots, one mechanic, one radio operator, three officials of the airline and a representative of the British Air Ministry, in addition to mail and freight. The total load amounted to one and one-half tons.

GERMANY

Ship-to-Shore Air Freight

THE ship-to-shore air mail service inaugurated last year by the North German Lloyd from the decks of the S.S. *Bremen* and S.S. *Europa* will be extended this year to include air freight, according to a recent announcement of officials of the steamship line. The maximum weight of the packages permitted will be twenty-two pounds and the maximum dimensions, twelve by twelve by ten inches.

The ship-to-shore air mail service was successfully operated last year on both sides of the Atlantic and was suspended during the winter months. This service is scheduled to begin this year in May.

Rocket Tests Successful

A ROCKET containing scientific apparatus was successfully shot into the air recently in tests conducted near Bremen by Karl Poggensee. The apparatus included an altimeter, cameras, speedometer and parachute. At 500 feet the parachute detached itself from the tip of the rocket and brought the test apparatus to earth intact.

THE dirigible *Graf Zeppelin* will be used for low-rate, short-distance flights this summer and will be available for charter flights, according to a recent announcement of the sponsors of the Zeppelin. The minimum fare will be $36 for flights of about four hours from Friedrichshafen over either Lake Lucerne, or the Black Forest or Tyrol, provided that from thirty to thirty-five passengers are carried on each flight.

The airship will be available for charter trips to groups of tourists, societies, clubs, a minimum of fifteen passengers or a maximum of thirty-five passengers being transported on each flight.

Tentative plans include a cruise over the Mediterranean to Egypt early in April, and to France, Spain, England and other countries in Europe.

[EDWIN P. A. HEINZE]

Spring Flying Schedules

EUROPEAN air transport companies began on March 1 their spring flying schedules which on the part of the German Luft Hansa have brought six new important lines into service. On April 1 this was further extended, after which date twenty-four home and twenty foreign ports were included. A number of lines have been extended considerably.

The Hamburg-Stuttgart line has been continued to Zurich in Switzerland; the line from Vienna to Munich now extends to Geneva in Switzerland; and the service between Essen and Mannheim has at one end been continued to Basel in Switzerland, and at the other, to Amsterdam in Holland. A special feature of this year's air services is the coöperation between Italian, Austrian and German air transport companies relative to which agreements were signed in January of this year.

From April 1 it has been possible to fly from Berlin to Rome. German planes now for the first time fly to Rome and Italian to Berlin. On the summer schedule the distance will be covered within thirteen hours.

The Luft Hansa has further reduced air travel rates which have now come very close to second class railway rates. The company reports that the traffic on its lines in January was excellent as compared with that of January, 1930.

Work of German Air Board

FOUNDED six years ago, the German Air Board has during this time worked with provisional statutes. Now, having gained the necessary experience, permanent statutes have been worked out and accepted. The German Air Board is the chief sports flying authority in Germany and a member of the Federation Aéronautique Internationale of Paris. It is responsible for the creation and the enforcement of sport flying regulations in its territory, representing the German flying sports movement on the F. A. I.

It has authority to permit or prohibit competitions, grant licenses, hear appeals against the decisions of juries and to enact penalties. The German name of this board is "Deutscher Luftrat," meaning German Air Council. According to the new statutes the number of members has been limited to thirty-nine. Of these, twenty-two are to be appointed by the air sport clubs and twelve by other aviation organizations. The managing body is limited to three persons who at the same time are members of the board. Two additional members, who must be aeronautical experts, may be elected by the general assembly.

THE FINNISH air transport company, which has operated the air service across Finnish Bay from Helsingfors to Reval throughout the winter, using Junkers planes equipped with floats, has ordered a number of Junkers, including Junkers Juniors.

New Model Junkers

THE Junkers Aircraft Company has evolved a new cargo plane from its old W. 33 model, the type employed in the trans-Atlantic flight of Koehl, Fitz-Maurice and von Hünefeld in 1928. The new plane has a large cargo space measuring 20.7 feet by 5.4 feet by 6.2 feet. The wing span is 95.14 feet; length of the fuselage, 60 feet; and

wing area, 1,248 square feet. The machine is built entirely of light metal, and can transport a load of 6,600 pounds. A single motor of 700 brake horsepower output is employed.

PRIZE competition for 3,000 marks, offered by the German paper *B.Z. am Mittag* for the first tailless airplane to cover a distance of 300 kilometres, expired at the end of last year without anyone having been successful in obtaining the prize. The competition has now been prolonged. An airplane competing for the prize must not cost more than 5,000 marks, nor must it have wheel landing gear, the object being to foster a very cheap, economical and efficient small plane.

GERMANY'S largest automobile club, the Allgemeine Deutsche Automobil-Club, has started an aviation section. The club has purchased an Argus-engined Klemm, stationed at Berlin, and a BFW plane with BMW engine, stationed at Munich. Using these planes the first members are being trained free of charge. Later a fee will be levied.

THE twenty-third air-sailing ground has just been licensed and will be placed in service during the year. It is situated near the town of Bielefeld. The North-West group of the German Aviation Union, which recently sponsored a campaign to promote sail-flight in the towns of Muenster and Hannover, has been successful in inaugurating coöperative working committees in these areas on which educational and government authorities as well as local flying groups are represented.

National Light Plane Race

THIS year the Aero Club of Germany intends organizing a national air race meet in which German and Austrian small planes will be eligible. This meet involves some interesting experiments, which are likely to have an important bearing on the future organization of the International Light Plane Competitions, now to be held every other year in alteration with the Schneider Cup Races.

The idea underlying the new regulations, which have just been worked out, is to make it possible for the spectator to see at a glance, which of the competitors is first without having to await the results of cumbersome calculations. The race will again be carried out in two classes of planes classified according to weight. The technical tests, which have been greatly simplified, will this time be held before the air tour and not, as in the international event organized last year by Germany, after the tour.

The machines will not receive good marks but good "minutes," which will be utilized in the handicap. The lighter planes, i.e., those of the small class, will in addition to any good minutes they receive for technical qualities, receive an equal number of handicap minutes. The competing machines will start in succession according to the number of good minutes (plus the handicap in the case of the small class) they have been awarded in the technical tests. That is, the machine with the largest number of good minutes will be started first, then follows the second best, etc.

All machines will be required to stop one or one and one-half hour at each stage port. Each day of the race, which will be over a 1,240 mile-route, the machines will be started in the same succession; the competitor first passing the finish line at each stage port and at the final port will always be the first man in the entire event. The race, for which $10,000 in prizes have been reserved, will be held on Saturday and Sunday August 15 and 16, starting and ending at Berlin.

AN AVIATION agreement has been effected between Spain and Germany, whereby the Spanish government has permitted the extension of German airlines to the Canary Islands.

ROUMANIA

AN Emsco high-wing monoplane has been constructed by the Emsco Aircraft Corporation, Downey, Calif., U. S. A., for Prince Jean Ghica of Roumania, Air Minister. The plane will be flown from the company's plant across the United States to New York City, dismantled and shipped to Germany, where it will be assembled and flown to Roumania.

The plane is equipped with a long-range sending and receiving radio apparatus and will be used by Prince Ghica on a projected flight from Bucharest to Durban, South Africa, to establish a new world's distance record.

FRANCE

French Air Budget

THE Chamber of Deputies approved on March 7 the Air Ministry budget of 2,033,000,000 marks ($79,287,000), $1,443,000 more than the 1930 budget, after removing the provision of $7,644,000 for subsidizing the French commercial airlines in South America, Madagascar, Indo-China and other countries. Provision for airline subsidies was scheduled for debate later, in connection with a subsidy for the Aeropostale company.

The 1931 budget includes $780,000 to encourage air touring, $5,109,000 for experimenting with new types of planes and $21,637,000 for building new military planes for the continental, Algerian and Moroccan air forces. The total cost of the continental and colonial French military air forces is listed as $26,832,000.

Set New Duration Records

FRENCH pilots, Lucien Bossoutrot and Aime Rossi, established on March 1 at Oran, Algeria, new world's distance and duration records for flight in a closed circuit by remaining in the air without refueling for seventy-five hours and twenty-three minutes during which they covered 8,805 kilometers (5,468 miles). The former records of sixty-seven hours and thirteen minutes and 5,218 miles were established by the Italian fliers Major Umberto Maddalena and Lieutenant Faustro Cecconi.

The world's duration and distance records for planes carrying a useful load of 2,000 kilograms were exceeded by the French pilots, Lalouette and Regimensi, who landed at Le Bourget Field on March 10. An official check of the flight showed that they had set a new duration record of seventeen hours and three minutes, a distance record of 2,678.6 kilometers, and an international speed record for the distance and the load of 157.99 kilometers per hour.

The previous endurance record, established by the German Risticz at Dessau in 1927, was thirteen hours, one minute and twelve seconds. The distance record was formerly held by the German Steindorff.

CANADA

[J. MONTAGNES]

Awarded McKee Trophy

THE McKee Trophy for 1930, the highest award for Canadian aviation, was awarded recently to Squadron Leader Tudhope of the Royal Canadian Air Force for his work in connection with air mail route surveying during the year. The award of this trophy, the fourth time since its donation by the first man to cross Canada from coast to coast by seaplane, J. Dalzell McKee in 1926, goes for the first time to a non-commercial pilot. The other three awards were made to pilots for work in opening the North West Territories by airplane.

Squadron Leader Tudhope has charted practically all the mail routes now in operation in the Dominion, and has 3,000 flying hours to his credit. His work last year involved not only flying on the prairies, but surveying the route across the Rocky Mountains to Vancouver, the stretch between Winnipeg and Toronto north of Lake Superior, and the route between Montreal and the Maritime cities.

Toronto Flying Club

THE Toronto Flying Club is doing considerable winter flying especially to winter resorts in the Muskoka Lakes region. The largest formation to fly from the club this winter has been a flight of eight planes of various types, making for Muskoka for a week-end party.

At the annual meeting of the club it was announced that the club flew 1,311 hours during the past year, using six machines. A. H. K. Russell, was elected president, and Wilfred A. Curtis, vice president. Other officers elected were: Norman Fox, secretary; Ernest Houghton, treasurer; Frank Coryell, publicity; Ernest C. French, entertainment; Arthur Flack, flying; Dr. W. E. Brown and Murray Capon, membership.

Aerial Animal Census

AN animal census from the air took place in Wood Buffalo Park, at the boundary of Alberta and the Northwest Territories towards the end of the winter. The park, which is a considerable distance from civilization, has a variety of big game, including 15,000 buffalo. The census was taken by means of photographs at a height of about 1,200 feet, the animals standing out well against the white background. It was expected that there would be some difficulty

in checking up on those animals which at the approach of the planes, had taken to the bush or were frightened into the wooded sections of the 15,000-square-mile preserve. The Royal Canadian Air Force undertook the job.

AIR mail service from coast to coast in Canada is expected to be effected this year. While government expenses are being pared to rock bottom there is still hope among the aviation and postoffice officials that the air mail will be completed to Vancouver over the Rockies, it being certain that nothing will be done on the Toronto-Winnipeg gap in 1931.

Air Mail Fire

WESTERN air mails were suspended for a few days early in March when eight planes of Western Canada Airways at the hangars at Stevenson Field, Winnipeg, were gutted by fire. Two trimotored Fokkers, two Fokkers Super-Universals, two Lairds, an Avron and a Fairchild biplane were burned when fire started in the cabin of one of the trimotored ships which was being tuned for the night mail to Moose Jaw.

[F. N. DASHWOOD]

Start New Airline

REGULAR weekly air transport service between Saint John, N. B., and Halifax, N. S., has been inaugurated by Canadian Airways. Fairchild 71's will be used.

A plane will leave Saint John every Saturday at 12:20 p. m., connecting with the train from Montreal, and arrive at Halifax at 1:50 p. m.; leave Halifax at 2:15 p. m., and arrive at Saint John at 3:40 p. m., connecting with the 4 p. m. train to Montreal.

The rate is $20 per passenger each way and freight will be ten cents per pound, minimum, one dollar. The service will be increased if business warrants.

ANNUAL dinner of the Halifax Aero Club was recently held. Officers elected were: R. J. R. Nelson, president, and E. C. Phinney and G. R. Harrison, vice presidents. During the winter, aeronautical lectures have been given in the N. S. Technical College.

MEXICO

Mexican Aeronautical Exposition

THE Aeronautical Industrial and Commercial Exposition will be held May 1-10 at Balbuena Field, Mexico City, Mexico, sponsored by the President of Mexico and other governmental officials, and endorsed by leading business interests, according to a recent announcement. The American Chamber of Commerce of Mexico will take part in the exposition.

American and European aircraft manufacturers will exhibit products at the exposition which will include, in addition to aeronautical exhibitions, an air show in which military and civilian planes will participate.

Jose Flavio Rivera is director general of the exposition; Lic Gustavo Espinosa Mireles, aeronautical director; president of the Aero Club of Mexico, industrial director; Alfredo Levy, member Board of Confederation of Chambers of Commerce, commercial director, and William E. Arthur, chairman of the American committee.

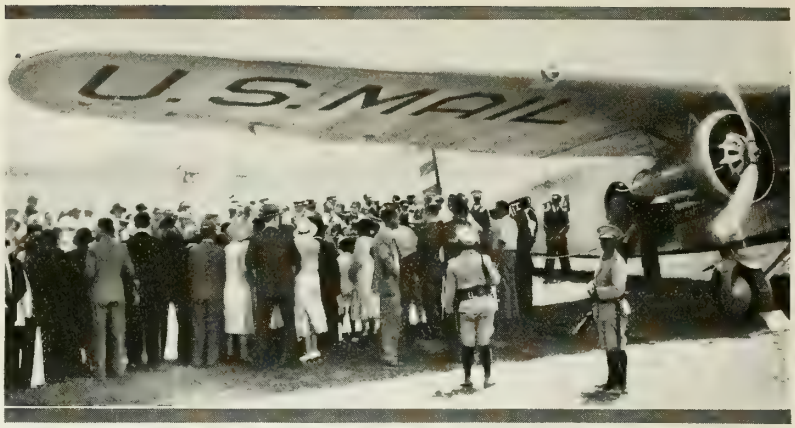
(M. HURST)

Air Mail Conference

REPRESENTATIVES of various air transport companies in Mexico have held a series of conferences with the Postmaster-General, Arthuro M. Elias, seeking a solution to the problems created by the loss of companies carrying air mail. Formerly the allowance given the aviation companies was on a kilometer basis, whereas now it is on a weight basis; the air mail postal rates have been reduced to more than half, the reduction has affected the aviation companies accordingly and adequate measures are desired.

Form Air Taxi Service

OFFICIAL announcement has been made that a concession has been granted to the Cia. Tamaulipas y Huastecas, S. A., a new airplane company of Tampico, by the Department of Communications and Public Works. This new concession will permit the company to establish an air taxi service



Prince of Wales and Prince George on aerial tour of South America

BRITISH HEIR ON SOUTHERN AIR TOUR

AMERICAN commercial aircraft equipment recently took the Prince of Wales on his longest non-stop flight. The Prince and his brother, Prince George, on their way to open the British Trade Exposition at Buenos Aires on March 14, traveled by air on several legs of their devious journey around the South American coast. They were flown in Fords and Sikorsky's equipped with Wasp engines. Both Princes are seasoned air travelers and seemed thoroughly to enjoy their flight. In two instances the Pan American System had the royal "salesmen" as their guests. On other trips the government of the country in which they were visiting acted as their host.

Pan American gave the Princes their first flight on the American continent, across the Isthmus of Panama. Two Wasp-equipped Ford trimotor transports carried the party from France Field, near Cristobal, to Paitilla airport at Panama City. The thirty-minute hop saved the group a tedious eight-hour boat trip through the Canal. At 2,000 feet, as the Prince commented, they were afforded a far better opportunity to see and appreciate the engineering monuments of Culebra Cut and Gatun Locks than would have been possible from the ground.

Alan Winslow, Pan American representative, acted as company escort for the trip across the isthmus. The Prince evidenced keen interest in the operating practices of the company, which Winslow explained to him. During the flight the efficiency of plane intercommunication by radio was demonstrated. The accompanying plane carried Lloyd Thomas, the Prince's private secretary who had suffered an injury while playing polo a few days before. A message was sent him concerning his condition. Thirty seconds later Thomas' reply, "Feeling fine, thanks," came in over the receiving set.

The half-hour hop across the isthmus was followed later by a four-and-one-half-hour non-stop flight from Lima to Arequipa well down the coast in Peru. This flight, the Prince remarked after landing, was the longest continuous aerial journey he had ever taken. Pan American-Grace were the hosts and carried the party in high speed Wasp-powered Ford transports. The new equipment made possible excellent time for the 500-mile-trip. An ice-box and small stove installed in the plane for the comfort of the royal passengers enabled the line to serve a hot lunch, tea and cold drinks en route. Homer V. Farris piloted the plane, flying most of the time between 5,000 and 10,000 feet altitude. Just before landing at Arequipa, Farris circled Mt. Misti, famous volcanic peak 20,000 feet above the sea, giving his passengers a good view of the mountain. An accompanying Wasp-powered Fairchild, flown by Harold Harris, vice president in charge of operations, carried the party's baggage.

Again while in Chile the Prince and his party took a number of short aerial trips visiting various points of interest there. A twin-Wasp Sikorsky amphibion owned by the government was used on these occasions.

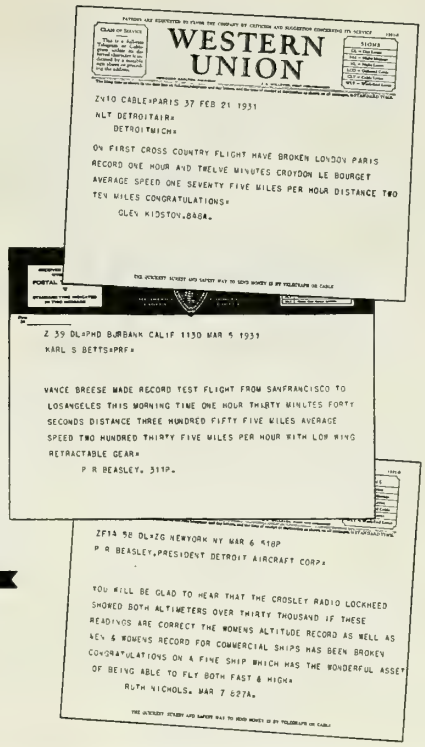


See the Two New
DETROIT LOCKHEEDS
at the Show

TWO new and still speedier models of the world's fastest commercial airplane—Lockheed—will be exhibited to the public for the first time at the 1931 National Aircraft Show. These are the Lockheed Orion; a low-wing ship with retractable landing gear—and the Lockheed Speed Vega; a high-wing model to be used by John Henry Mears on his proposed 'round the world flight.

See these two new Lockheeds, the new Speed Ryan and the Eastman Flying Yacht, at the booth of the Detroit Aircraft Corporation — spaces 73 to 91 Clarence Young Airway. Also on display will be Lockheed models identical with those which have recently set four new world's records: London-Paris, fastest time; San Francisco-Los Angeles, fastest time; and the women's altitude record which also stands as a new men's and women's altitude record for commercial planes.

DETROIT AIRCRAFT
LOCKHEED
VEGA


WESTERN UNION

ZV10 CABLE=PARIS 37 FEB 21 1931
ALT DETROITAIR=
DETROITWICH=

ON FIRST CROSS COUNTRY FLIGHT HAVE BROKEN LONDON PARIS RECORD ONE HOUR AND TWELVE MINUTES CROYDON LE BOURGET AVERAGE SPEED ONE SEVENTY FIVE MILES PER HOUR DISTANCE TWO TEN MILES CONGRATULATIONS=
GLEN KIDSTON.848A.

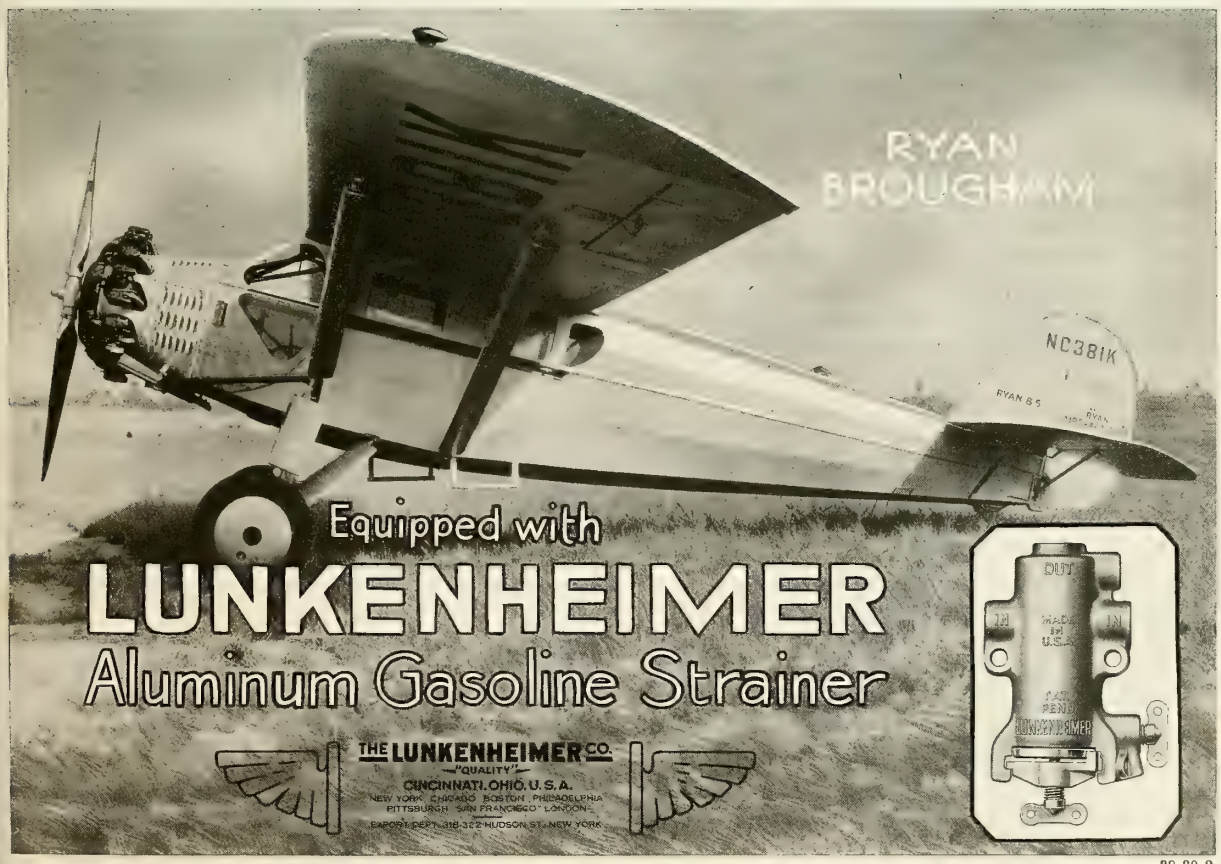
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KARL S BETTS=PRF=

VANCE BREESE MADE RECORD TEST FLIGHT FROM SANFRANCISCO TO LOSANGELES THIS MORNING TIME ONE HOUR THIRTY MINUTES FORTY SECONDS DISTANCE THREE HUNDRED FIFTY FIVE MILES AVERAGE SPEED TWO HUNDRED THIRTY FIVE MILES PER HOUR WITH LOW WING RETRACTABLE GEAR=
P R BEASLEY. 311P.

ZF14 52 DL=ZG NEWYORK NY MAR 6 918P
P R BEASLEY,PRESIDENT DETROIT AIRCRAFT CORP=

YOU WILL BE GLAD TO HEAR THAT THE CROSLEY RADIO LOCKHEED SHOWED BOTH ALTIMETERS OVER THIRTY THOUSAND IF THESE READINGS ARE CORRECT THE WOMENS ALTITUDE RECORD AS WELL AS MEN & WOMENS RECORD FOR COMMERCIAL SHIPS HAS BEEN BROKEN CONGRATULATIONS ON A FINE SHIP WHICH HAS THE WONDERFUL ASSET OF BEING ABLE TO FLY BOTH FAST & HIGH=
RUTH NICHOLS. MAR 7 627A.

DETROIT AIRCRAFT
FORT AND CAMPAU STREETS, DETROIT



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A Boeing Master Pilot diploma means that the graduate has learned —in the classroom, in the laboratory, and in the air—all essentials that schooling can teach him for a career in commercial air transportation.

He has had 203 hours of flight instruction—50 dual, 153 solo—and 924 hours of ground school training.

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Shorter Boeing courses, less expensive than these, are offered for those unable to take such all-inclusive training—courses using the same splendid equipment and taught by the same veteran pilots and mechanical experts.

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☐ Private Pilot ☐ Boeing Master Pilot
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Name.....
Address.....
City..... State.....

THE PILOT'S AIRCRAFT COMPASS

(*Continued from page* 55)

times. On each round trip the route was flown in one direction by compass plus landmarks and in the other direction by landmarks alone. An experienced cartographer was carried in the rear cockpit as an observer and noted the actual position of the plane every two minutes. The route was well marked and the cartographer, for greater accuracy, carried a large scale chart setting forth the deliniation of the surface in great detail. The tracks of the plane showed greater variation from the direct route when the course was steered by landmarks alone, and the average time advantage in favor of the compass-directed course was about two and one-half minutes for the 120-mile trip.

If the result of this experiment is taken as a criterion, a direct comparison of the two methods of flying a route may be made on a purely commercial basis. Let us assume that an airline operates two planes per day over a route 300 miles long. Each plane makes an average of 300 trips per year. The cost per flying hour is $50. One pilot steers by compass and landmarks; the other by landmarks alone. Using our figure of a time advantage in favor of the first pilot of two minutes per 100 miles, the first pilot will cover the route on an average of six minutes per trip sooner than his colleague. During the course of the year both pilots will have accomplished the same mileage but the compass-steering pilot will have done so in thirty fewer flying hours. At the rate of $50 per hour, it will have cost the company $1,500 less to operate his plane. Which of the two pilots, other factors being equal, is of greater value to his employer?

Aside from the greater safety and economy of flying the course by compass, the increasing necessity of a rigid time schedule renders this procedure practically obligatory. With increase in aerial travel the time schedule becomes of moment. Already airline schedules interlock with those of railroads and other aerial transport companies. Pilots who cannot, or will not, take the trouble to become proficient in compass flying will find it increasingly difficult to secure and retain permanent employment. And in addition to this physical knack of compass steering, they will find it essential to understand the compass error in order to determine the correct direction to be steered. Therefore, in the next article of this series we shall discuss the compass error and the compensation of the compass.

WHAT OF THE GIANT AIRPLANE?

(*Continued from page* 53)

satisfactory service performances have been recorded for geared drive. The combination of reduction gears and variable pitch screws will, naturally, still further increase the utilization of the engine horsepower.

For the variable pitch screw there is claimed "a thirty per cent faster climb, thirty per cent faster cruising speed at lower engine r.p.m., gasoline consumption decrease of approximately twenty per cent, a decrease of fifty per cent of take-off time with full load."

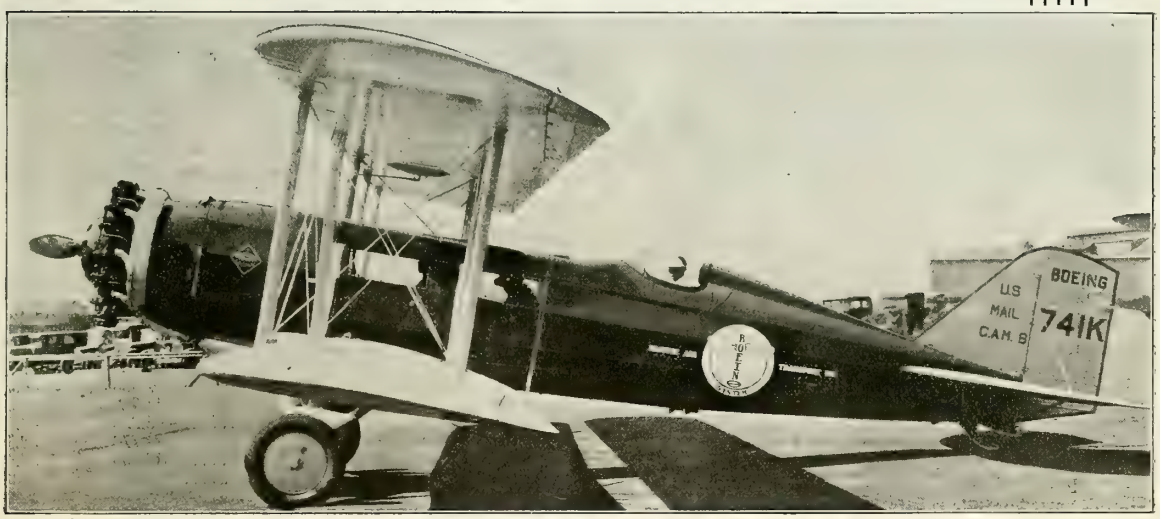
At any rate, the giant offers plenty to think about, not the least of which is pilotage—and, without doubt, the automatic pilot of a decade and a half ago will come into its own, but the most immediate question is that of power.

Steam

Shades of Sir George Cayley, Henson, Maxim and Langley! Is steam to come into its own for aircraft after a century and a quarter of demonstration. Rumor has it that here and there about this land of ours steam plants

(*Continued on following page*)

...MORE BOEING 40-B4s now ready for immediate delivery!



The same high standards of material, manufacture and inspection that made the "Boeing Forty" outstanding in its field will be found in the latest Boeing 40-B4, mail four-passenger Hornet-powered plane. Immediate delivery.

The Boeing Forties, some of which have already been flown more than 3000 hours, have a service record of more than 5,000,000 miles with seven air mail-passenger lines.

Ask for detailed performance records of these dependable, economical planes in the service of transport lines and other business firms.

Our exhibit space—Detroit Aircraft Show—Spaces 121-133

BOEING
AIRPLANE COMPANY
SEATTLE, WASH.

A division of the United Aircraft and Transport Corporation

(In Canada: Boeing Aircraft of Canada, Ltd., Vancouver, B. C.)

(*Continued from preceding page*)

are being projected, graphically and financially, in units from as low as 100 horsepower to as high as some 2,000.

Adherents of steam claim the same weight per horsepower as the best gasoline engine, or better. If steam is compared with gasoline in an airplane such as the Dornier, with engines scattered about in the open air, the steam people convert the drag of these engines into payload; but, as pointed out elsewhere, it is to be doubted that anyone will claim that the Christmas-tree method of powerplant installation is to stay with us.

Even if there is no gain in payload, there is a considerable saving in fuel cost. No small item is the cost difference between the steam plant's crude oil alone and the combined gasoline and lubricating oil of the internal combustion engine, the fuel consumption per horsepower-hour even being considered as the same. Powerplant overhaul may be figured at 5,000 hours instead of 500, and the life is more or less indefinite when it comes to steam. Steam depreciation is, thus, one-tenth that of the garden variety of airplane engine.

The security of performance of steam is something not to be said in figures; steam, as everyone knows, is almost infallible. Then, as mere minor considerations, there is the absence of exhaust, engine and propeller noise and vibration. Accessibility is enhanced, for it is assumed that there will be one or two great central plants with the power piped out, perhaps to the engines or turbines in the wings or streamlined and placed outboard, since these units are very small and present little drag. The steam airplane maintains its efficiency at high altitudes.

The Airplane and the Airship

One of the outstanding characteristics claimed for the airship is its huge useful load. Another is the space provided for passengers and goods. Parenthetically, if bulk space and huge loads are advantageous in an airship, they might also be of value in the airplane—an argument for the giant plane.

However, it is not all beer and skittles with the airship on the useful load ratio basis. The helium-filled *Los Angeles* has a useful load of 26.4 per cent of the gross, or some 28,235 pounds. If the data are accurate, the Caproni 90 has a useful load of some 65,000 pounds on the basis of her 66.6 per cent useful load.

There is the matter of cost, for objection has been raised to the investment of so much money as is involved in the giant airplane. It is said that the *Los Angeles* cost Germany something like $1,000,000 to build. The retail price of the two airships now building for the Navy figures out at $18 a pound of structure, whereas the airplane is retailed at $6 to $7. A new airship project is estimated at $30 a pound.

Of course, it will be admitted that the airship has an advantage when it comes to range, but here again, save possibly for over-water journeys without any intermediate stops, who knows for certain that long-distance non-stop flights will be required for either passenger or goods transport? There are no through non-stop trains across the continent, for example. The Pacific steamers stop at Hawaii. People may want to get off or get on the aircraft, or there may be mail or goods to be dropped or taken aboard. If necessary, refueling of the giant airplane may be done either on the land or water at scheduled stops or in the air without waste of any time.

And it does seem that inherently the airplane will ever have the greater speed, the greater payload ratio, and, if one may venture the opinion, a better "on-time" record.

When the airplane offers almost absolute security, with reasonably ample space and other attributes conducive to the luxury of travel, combined with its inherently high speed, the question of the airplane versus the airship will become somewhat closer to solution, particularly when the sales price per pound of structure is $6 for the airplane against the estimated $18 to $30 for the airship, and the useful load carried per pound of structure is nearly doubled or better in the airplane.

SOME FOREIGN PLANES

	Gross wt. (Pounds)	% useful wt. to gross
Bréguet *Question Mark*	14,745	67.3
Junkers W.33L *Bremen*	8,592	66.6
Caproni 90	99,000	66.6
Savoia 64	15,400	65.7
Farman *Blue Bird*	25,350	65.2
Caspar *32 Germania*	8,374	63.4
Dornier Super-Wal	33,080	58.6
Dornier Do.X	99,200	55.5
Farman 160	17,400	54.6
Udet Rohrbach Rocco	28,430	54.2
Rohrbach Roland	15,800	53.
Dornier Super-Wal	26,480	51.6
Dornier Super-Wal R	33,000	50.
Dornier Wal	15,420	50.
**Friedrichshafen*	28,640	50.
*Siemens-Schuckert	26,460	49.9
Dornier Merkur	10,140	49.3
Lioré & Olivier 20	12,320	48.7
Rohrbach Romar	41,800	47.9
Latécoère 38	23,400	47.9
Junkers G24W	17,640	45.
Rohrbach Rocco	23,160	44.8
Westland Wapiti	5,450	44.2
S.P.C.A.	19,140	43.7
*L.H.W.	31,080	43.3
Rohrbach X	35,750	42.2
Breda CC. 20	26,400	41.7
Focke-Wulf Möwe	7,960	40.9
Junkers G.31	16,980	40.3
Junkers G.24	13,230	40.
Zeppelin Staaken	21,770	38.5
Supermarine Southampton	14,130	37.
C.A.M.S. 52	15,114	35.9
Junkers F.13	4,409	35.2
Short Singapore	20,031	34.8
*D.F.W.	28,230	32.8
Aviation Leipzig	27,800	28.5

*Wartime bombers

SOME AMERICAN PLANES

	Gross wt. (Pounds)	% useful wt. to gross
Bellanca *Columbia*	5,399	65.2
Ryan *St. Louis*	5,105	57.8
Bellanca Freighter	4,600	50.
Fokker 7 *America*	16,530	46.6
Bellanca Pacemaker	4,300	45.
Consolidated Commodore	17,600	44.5
Curtiss Pigeon	7,600	44.2
Buhl Ca-8A	6,300	44.
Ryan B-5	4,000	43.7
Ford 5-ATC	13,500	43.7
Fairchild 71-A	5,500	43.
Boeing Monomail	8,000	42.3
Metal G2W	5,800	42.
Lockheed Vega	4,261	41.5
Fokker Universal	5,550	41.4
Fokker F-14	7,200	41.
Consolidated 17	5,600	40.6
Boeing 80-A	17,500	40.5
Bach 3CT	8,000	40.1
Fokker 10A	13,000	40.
Sikorsky S-41	12,500	40.
Keystone Patrician	16,600	38.5
Sikorsky S-38	10,480	38.
Travel Air A-6000A	5,250	38.
Stearman LT1	6,250	38.
Boeing 40-A	6,080	37.5
Fokker F-32	22,500	37.
Hamilton H-45	5,750	36.7
Stinson Sm6B	5,350	36.5
Ford 4-ATE	10,130	35.8
Stinson SM6000	8,500	35.
Curtiss Condor	17,378	34.5
Ireland N2C	4,900	33.2
Ford 5-ATCS	13,500	33.

WAY DOWN SOUTH

(*Continued from page 49*)

living except dance with debutantes and fall off hunting horses. But a review of his globe-trotting activities in the past twelve years reads like the Hasheesh dream of a confirmed Cook tourist. In 1920 he visited New Zealand and Australia, California, Honolulu and the Fiji Island. In 1921-22 he was in Gibraltar, Malto, Bombay, Mandalay, Japan, China and Manila. In 1923 he was in Belgium and Canada. In 1925 he toured West and South Africa and visited South America. In 1926 he was in France, in 1927 in Canada, in 1928 and 1930 in East Africa. And in 1931 where do we find this champion traveler, this royal cosmopolitan, this contact man for the far flung business interests of the British Empire? Why, in Latin America, of course, visiting several of its republics and officially opening the British Trade Exposition at Buenos Aires.

With all due respect to the Prince's sociable disposition and personal charm, not to mention his taste in neckties and golf knickers, it isn't reasonable to suppose that he went all the way to Brazil to look for more dancing partners or to get a new set of labels on his luggage. Nor is it likely that the British Trade Exposition needed an experienced expert to open it, or that the show couldn't have gone on without a couple of British Princes present to make it respectable. The news is that the Prince of Wales and his brother are visiting Brazil and incidentally opening an exposition; the news behind the news is that Great Britain considers it worth while to send its star salesmen into South America to recover and restore British prestige in the world's most-promising market.

We should understand this maneuver, for we have done the same thing ourselves. It isn't long since Colonel Lindbergh—whom Mayor Walker of New York has lately christened the "Prince of Sales"—made a personally conducted tour of Latin America by air to create goodwill and commercial confidence between the two western continents. To make the parallel more convincing, it is well to remember that the Prince of Wales is almost ostentatiously a patron of British-made aviation, using the airplane regularly both for business and pleasure. No doubt he does so because he likes it, but he also does so because it is good business policy. The aircraft market in Latin America is one of the prizes of the world's future business, and England knows it. That is one reason why the star salesman of the Empire is allowed all the air mileage he likes on his expense account.

There are other signs of keen competition for the aeronautical business of Latin America. Some time ago there was considerable fuss over the flight of General Balbo and his twelve Savoia-Marchettis from Italy to Brazil, which was called a goodwill flight and ended very acceptably to the Italians in the sale of their ships to the Southerners. Business inspired the trip, though skill and courage accomplished it. And the same is true of certain flights from France.

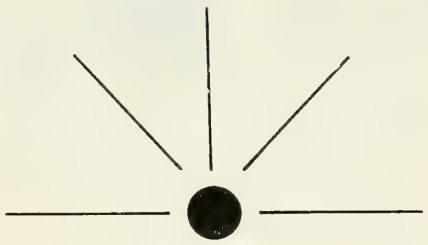
The breaks of the game and the fortunes of war gave the United States a chance to bid on even terms with the rest of the world for the business of South America. Our investments down South are now about the same as those of England, with the difference that British money is concentrated chiefly in Brazil and Argentina, while ours is spread farther and thinner through Latin America. We now have banking connections there, to compete with England's foresighted financing of her foreign trade. We have redeemed our reputation by improving the quality and workmanship of our export goods, and perfecting their

(*Continued on following page*)

"Newmanlite"

AIRPORT FLARES

A necessity for all airports, whether or not equipped with the usual flood-lighting systems



"Newmanlite" FLARES will illuminate your airport for one minute or more with a powerful 80,000 candle power light, enabling safe landing under almost any weather condition.

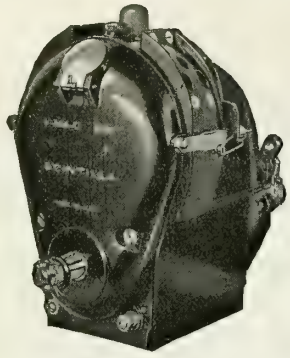
Very Nominal Prices

WRITE FOR PARTICULARS

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2 East 45th Street, New York City

SCINTILLA
AIRCRAFT MAGNETOS



THIS company expects that the use of Scintilla Aircraft Magnetos will always be in direct ratio to the service its product gives the great industry of aviation.

Effort is concentrated on building a unit that will perform faithfully and well; with full knowledge that aviation engineers recognize good performance when they see it.

SCINTILLA MAGNETO CO., INC.
SIDNEY, NEW YORK

Contractors to the U. S. Army and Navy
(Division of Bendix Aviation Corporation)

DEPENDABILITY
SIMPLICITY
ACCESSIBILITY

(Continued from preceding page)

methods of packing and freighting. We have ships of our own to carry our own products. We have excellent air mail communications with our Southern neighbors. We have a very great advantage in a balance of trade that is favorable to South America, which is another way of saying that at present we buy more from our neighbors than we sell to them. In the fiscal year that ended June 30, 1930, for instance, Latin America was about $65,000,000 ahead on the exchange of business between the two countries, which means that our neighbors could spend that much more on our merchandise and still be able to pay us in American dollars.

But a special advantage for the aircraft manufacturer in competing for business down South should be the quality of the goods he has to sell. It is reasonable to suppose that the conditions under which the aviation industry in the United States has developed to its present proportions have resulted in a highly competitive product. Lacking a lot of the artificial stimulation which has been given to the European manufacturer, the American builder of aircraft, engines or accessories has been compelled to deliver the utmost value for the dollar. Competition among designers, manufacturers and operators has been keen and sometimes ferocious, so that only soundness, excellence and efficiency could survive it. And, in addition, the magic of highly organized production, characteristic of the American mind and method, is having effect both on quality and economy in aircraft production.

On these terms and with these advantages, the United States aviation industry should be able to bite off a big share of aeronautical business in Latin America. It can do so if its marketing methods are as aggressive, ingenious and intelligent as its production policies. The customer is ready for the merchandise and has the money to pay for it. Somebody should get busy and sell it to him, before the Prince of Wales walks off with the order.

And so, you salesmen, brush up on your Spanish, study your geography and get yourself a good golf stance. Know your product and find out where it fits into the needs of the land of magnificent opportunities. Offer it as good stuff and good value, tested by tough experience in a country that takes its commercial aviation seriously. Give your word that it's good and make it stick. And watch the Prince of Wales. He's a smart lad, as well as the last limb of real royalty left in the world. The ladies like him, and the men do business with him. And he's not in South America for his health, but to rebuild the business prestige of his nation in the best and brightest new market of this generation.

AMERICAN AIRPLANES IN LATIN-AMERICA

(Continued from page 38)

tion of hostilities, the majority of these factories turned their energy to the designing and building of commercial and pleasure planes. Today, there are several large companies and many smaller.

With the advent of these civil airplanes, the manufacturers in the United States at once began to receive inquiries from many of the countries in South America regarding their adaptability for service. In many cases, representatives journied thousands of miles to the United States to buy planes directly from the factories. Eventually, of course, the larger manufacturers sent salesmen to demonstrate their planes in the places of their projected

usefulness.

Among the prominent American fliers who have demonstrated American planes in American countries outside the United States have been Lieutenant James H. Doolittle, Colonel Charles A. Lindbergh and Major Dargue who led a squadron of Army planes on a good-will tour of American Republics.

Although various European manufacturers of airplanes have sought to compete with American manufacturers for business in the American market, the planes and engines originating in the United States have enjoyed almost unchallenged popularity. There are two particularly strong reasons for this.

In the first place, American commercial and pleasure airplanes are designed and built primarily for these purposes but readily adaptable in emergencies for military purposes, whereas the majority of European airplanes are designed and built primarily for military service with adaptations to fit them for business and sport. Naturally, in consequence, the American planes are superior to those of European origin and enjoy a merited popularity in commercial and pleasure use because of their economical operation.

In the second place, there existed after the end of the World War no surplus of American military planes for conversion to peace-time usages. As a result, plane manufacturers did not glut the South American commercial and pleasure plane market with obsolete planes dumped at any price for ready disposal. The leaders of commercial aviation in the United States have every right to claim that all their dealings with the other American Republics have been fair and square. As a result, South Americans have come to trust and have confidence in the airplanes they have bought from their Northern neighbors.

Finally, the airplane industry in the United States has made every effort to serve the South American market with real intelligence and, before plunging into hectic sales campaigns, to learn the needs of those whom it would have as permanent and regular customers. One instance of this policy appears in the first airplane factory ever established on the South American continent. Over a year ago, the Curtiss-Wright Export Corporation, cooperating with the government of Chile, built and equipped a modern airplane factory on Los Cerrillos Airport, Santiago de Chile (incidentally, one of the finest airports in the world).

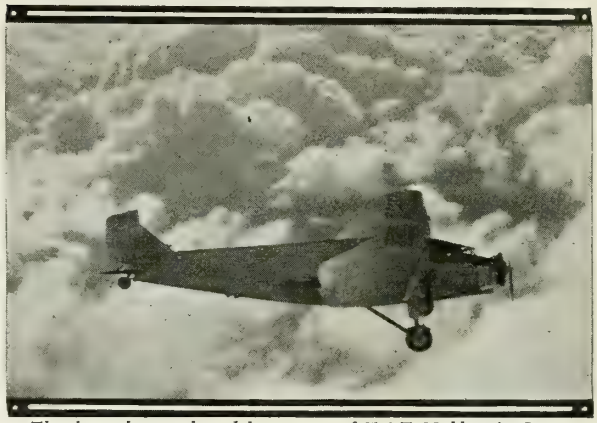
It has been found that this factory was urgently required to provide the military and commercial planes needed in Chile. Although such planes could have been manufactured in the United States and shipped to Chile, much time and money could be saved the Chilean government by building a factory there. The fact that this was done illustrates the genuine desire of American aviation to serve its customers well.

Incidentally, there has been another factor of vast importance in developing aviation in the South American countries in which North American enterprise has taken the initiative. This, of course, is in the establishment of the Pan American Airways system.

Faced with vast problems in laying out a practicable route and schedule, as well as in planning operations safely and successfully, this company has achieved notably a most difficult program. Already, this line, which is the longest airway in the world, is functioning with great satisfaction. If the project had been a railroad of comparable extent, it would have been years before the first train could have made the first round trip run.

(*Continued on following page*)

AIR TRANSPORTATION MADE SAFER
With the RACON AIRPLANE SPEAKER



The above photograph used by courtesy of T.A.T.-Maddux Air Lines

The ALL-WEATHER PROOF HORN

One of Racon's Latest Achievements!



RACON AIRPLANE HORN

For all outdoor use. This horn has been perfected after years of exhaustive research in Racon Laboratories. Will withstand all weather conditions. Guaranteed for one year. Requires no replacements or servicing after heavy rainstorms. . . .
Prices slightly higher than regular horns.

THE use of radio in aircraft operation is made doubly valuable with the new Racon amplifier. Air transport companies will find it of inestimable value in the safe delivery of passenger and express cargoes during bad weather. During recent tests in Chicago, in a snow storm, the voice was distinctly audible more than a mile away. No pilot or operator can fail to realize the import of establishing communication between the plane and the ground crew preparatory to landing when visibility is so poor that a safe 'set-down' is nothing more than a matter of good guess and plenty of luck.

FOR AERIAL ADVERTISING

Through the Racon Airplane Speaker the broadcaster's voice can be heard for miles. Even though the plane may be hidden in the clouds, the voice—or music—can be heard above the din of city traffic. During the Chicago tests music was broadcast from a phonograph record and was heard very clearly several miles away.



LIST PRICE $35

Baby Electro Dynamic Horn unit. Rating 15 watts, continuous operating load 7 watts.

The Racon Airplane Speaker was designed for airplane or airport use. It is very light and compact and was built to withstand rapid changes in air pressure. Instead of the usual dynamic unit, the Racon horn is equipped with four apertures, utilizing four Racon Giant dynamic units. Consequently the Racon horn has four times the ordinary volume.

Racon horns and units are covered by U. S. Patents Nos. 1,507,711, 1,501,032, 1,577,270, 73,217, 73,218, 1,722,148, 1,711,514, 1,781,489



Giant Electro Dynamic Horn unit. Rating 30 watts, continuous operating load 10 watts.

Write for complete description and price.

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Writing their Records in the Ground

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GOHI CULVERTS MFRS., Inc.
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GENUINE OPEN HEARTH IRON GOHI PURE IRON - COPPER ALLOY

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"Wishing"
won't bring you those hours



BUT THE HEATH PARASOL WILL!

Flying hours — hard to get? Not a bit with the new Heath Parasol! For this great little plane, with its remarkably low landing speed and its complete visibility has been designed for beginners to fly! And its complete flying cost — actually less than 1 cent a mile — including gas, oil and storage, brings big plane safety and performance for the first time at a price all can afford!

$975 is the amazingly low price of the Heath Parasol, including balloon tires, brakes, metal propeller, engine starter, and the famous Heath B4 motor, exclusively an aircraft power plant. Or you can build it from clear easy plans for $199. Parts may be purchased in 11 convenient, progressive groups. $12 brings the first shipment.

Won't you let us tell you more about America's most popular sport plane? 10 cents in stamps or coin brings our large illustrated booklet. Write for it today.

HEATH AIRCRAFT CORPORATION
Dept. A 431
1721-9 SEDGWICK ST. CHICAGO, ILL.

(Continued from preceding page)

Now, this airway system brings untold benefits to the United States. That goes without saying, or it would never have been organized. Sponsored in effect by President Hoover and consecrated to service by Colonel Lindbergh, it has been established as an aid to American business.

At the same time, this airway has brought benefits to the South American countries no less in extent than those conveyed upon the United States. Business correspondence has been expedited; travel has been accelerated; and a closer relationship has been stimulated between every country in the New World by this aviation venture.

Parallel to this transportation advantage is the more subtle stimulus to the use of aviation on a smaller scale for business and pleasure. Millions of Americans in many countries live along the route of the Pan American Airways. Day after day they see the airplanes fly by over head. Gradually, they come to accept flying as a natural method of travel from the familiarity which it has assumed in their lives. Therefore, if for no other reason, we expect the South American countries one day to offer one of the world's greatest and most active markets for the airplane. To that end, we are seeking to conduct our business relations with such good will and good faith that they will be permanent and steadily increasing.

To our friends of the other American countries, we of the United States in aviation offer our best wishes. We hope that you will reasonably soon reap all the pleasures and advantages of flying in ways which will make life more comfortable and joyful. We congratulate you for having inspired the effort of AERO DIGEST to bring our aviation to you. We look forward to the day when you will fly thousands of miles in thousands of planes upon thousands of errands of joy and advantage. We salute you.

ANALYSIS OF AVIATION EXPORTS

(Continued from page 45)

the recently released official figures.

French exports of complete aircraft and parts in 1930 amounted to about $8,447,400, a decrease of $130,000 under the total sales for 1929. The leading French markets were Soviet Russia, Yugoslavia, Belgium and Brazil. Although the published figures do not show the types of machines exported, it is believed that the bulk of French exports were military landplanes.

Although Soviet Russia in Europe purchased during 1930 forty-six engines from the United States, at a valuation of $180,000, the thirty exported to Germany had a higher valuation. The latter shipments included those in the Do.X and others preliminary to manufacture under license. With 377 engines exported from the United States, there were fifty-six more than during the preceding year.

German exports of complete aircraft for 1930, figures on those for spare parts and engines not being available, were 135, valued at $1,420,000, of which thirty-one went to Great Britain, twenty-seven to Russia and eleven to the United States. In addition to these three leading markets, nine German aircraft went to Sweden, four to Spain and four each to Australia, Argentina, Brazil, France and Japan. Junkers "Juniors" and other light aircraft are believed to have been in the majority in these exports to certain countries, accounting for the low average unit value of shipments to certain of them. A few Dornier seaplanes and Junkers single and tri-engined transports were shipped during the year to South America, the Far East and Oceania.

Italy, according to 1930 official statistics, exported eight

landplanes and one seaplane valued at about $40,000 and $5,000, respectively. Data on countries of destination are unavailable. Parts exported from Italy in 1930 were valued at $240,000. The recent sale to Brazil of seaplanes flown there, and negotiations in process for the sale of military equipment to Russia, indicate that Italy intends to attempt to develop a world market for her aircraft.

Shipments of aircraft accessories and parts from the United States during the year under review went to fifty-nine countries, and were valued at more than $2,350,000, as compared with a $2,252,000 valuation for exports of these items during 1929. The introduction into new markets of various safety devices and other accessories, and the more universal tendency to sell complete sets of spare parts with new aircraft, were additional factors which helped the United States aeronautical industry retain its foreign trade in 1930.

The products of United States aeronautic factories should be of increased interest to overseas operators and governments this year. The variety and recently increased performance of United States military types are well known. Prices are attractive and the industry experienced in handling orders from abroad. In addition to the orthodox types so well known in many parts of the world for their sturdiness and economical operation, there are recently available some transports of improved performance and some new light aircraft. In the former category there is a wide choice of refined multi-engined and single-engined passenger and cargo transport planes developed as the result of operating experience over the intra-United States airlines and those operating internationally. In the light plane field there are now available several single and two-seater types for the sportsman pilot and for training in clubs and schools, both military and commercial. With less than fifty horsepower and selling for less than $1,500 at the factories, some of these models can be operated at less than $2 an hour, and should be of value for operation at bases not exceeding 6,500 feet above sea level. There are also available some refined and improved open and closed planes in the medium-sized and priced class which should help bolster the sale of aviation products with overseas territories.

As is well known, the keynote of United States military aircraft is standardization. Some of the American standard military types are necessarily as much as two years old, since it takes that long to get them through the process of development and refinement before definitely decided upon for general use. By our system, performance is sometimes sacrificed for greater facility of supply. Ruggedness and aerodynamic qualities, however, are never sacrificed. The foreign air service which purchases military equipment of a make and type which has been definitely standardized upon by the United States military services can be assured that the equipment has been thoroughly tried out and proved. The American military aircraft not as yet standardized upon, some exceeding 200 miles per hour in speed, which has been developed and tested by its manufacturers (with Army and Navy collaboration) with the idea of obtaining United States Government orders, may, in some cases, be available for overseas sale. In this connection, the observation may be of interest that one European single-seater pursuit plane among those most widely used both within and outside its country of origin, is a few miles an hour slower than the present American standard pursuit plane. The American type has a safety factor of twelve—the minimum required—while the other has a safety factor of eight.

(*Continued on following page*)

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BALSA WOOD

Was used on the Spirit of St. Louis

and it has been used by leading aircraft manufacturers ever since

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Unexcelled for insulating, streamlining, wing ribs, strut fairings, wing tips, sound-deadening partitions, fuselage shaping, pontoon filler, light-weight crates for transporting perishables.

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Use only AIRSEAL Balsa Wood and be sure of success in the Wakefield Trophy Contest at Dayton in June. For Scale and Flying models.

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SPORT-TRAINER, $2950 to $3650

2-3 place, side-by-side, dual control, Hi-wing monoplane (not a toy), 95-125 h.p., 110-130 m.p.h.

TRANSPORT, $12,500 to $15,000

1,200 to 1,600 pounds payload, 130-140 m.p.h., 300-400 h.p. 6-8 place, cabin monoplane.

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Courses $100 and up at Jersey City Airport. Wish to hear from responsible schools to join system and secure our service and help.

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If you wish to form a flying club we will assist.

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Any type plane or motor. Rates reasonable.

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Telephone Bergen 3-7330

(*Continued from preceding page*)

The varying and often adverse flying conditions in the United States, making it necessary for aircraft to be maintained sometimes thousands of miles from its base, make ruggedness and relative ease of maintenance necessary. Strength, facility of maintenance, guaranteed performance and flying characteristics enabling the safe employment of less extensively trained pilots than are always available in overseas territories, are factors to be considered by foreign governments and commercial operators in their supply problems.

LINKING THE AMERICAS BY AIR

(*Continued from page 37*)

of articles which can be economically carried by air will increase.

I have mentioned the two land bridges over which the air transports fly between North and South America. One line branching out from the vast network of airlines in the United States and Canada at Miami, Florida, follows the West Indies to the Guianas and the long coast of South America to Santos, Brazil, covering a distance of 6,251 miles. Another from Miami extends to Cuba and Jamaica, across the broad Caribbean Sea to Panama, along the west coast of South America to Santiago, Chile. Thence it crosses the continent with its high backbone to Buenos Aires, Argentina, and Montevideo, Uruguay, a total distance of 5,839 miles. A third line connects Miami and Panama by way of Cuba and Central America, a route 2,141 miles long. Two flights a week are made in each direction over these lines and one flight a week in each direction over the eastern line south of Porto Rico. Three flights a week are made north of San Juan, Porto Rico. The fourth line, between Panama and the United States and Canada, runs through Central America and Mexico with the gateway at Brownsville, Texas. Flights are daily between the Texas city and Mexico City, and twice-a-week service prevails to the south.

Another line was operated for some time between San Diego, California, and San Salvador, El Salvador, via the west coast of Mexico, Mexico City and Guatemala City, Guatemala. It is hoped that before long the far western part of the United States may again be thus closely connected with those southern points and, by such a line likewise all centers in Central and South America. A shorter line which has become important is operated daily between El Paso, Texas, and Mexico City, a distance of 1,004 miles. Other lines are operated by the same Mexican company, one of them across the country from Matamoros, on the Gulf of Mexico, to Mazatlan on the Pacific.

Some 17,000 miles of airlines connecting with those mentioned are in regular operation in South America and countries south of the United States. About one-third of this mileage is under the French flag, being operated by the Aeropostale company which carries on a weekly service between South America, Africa and Europe. Steamers are used for the South Atlantic crossing, but it is planned to use powerful aircraft to shorten the time required for the carriage of mail between Europe and South America. Most of the remaining mileage is along the coasts of South America. Some lines penetrate into the interior, and demands are being made for the rapid extension of air services to the many important points not yet served.

The large and widespread systems of the United States and Canada are being extended further each year. From hours to weeks are saved by the use of these air services, and great savings of time are now made in the carriage

of mail, passengers and goods southward. Airlines running north and south, connecting those running with the sun across the Americas, are hastening the increase in trade between the north and south, in addition to the old east-west flow of commerce. All parts of the two continents may exchange goods quickly and to mutual advantage more than ever before. Some years ago fast American steamers cut down enormously the time required for travel and transportation between points in the United States and the east coast of South America. Air services have cut that time in half. A letter may be sent to almost any point in the Americas from a given point and a reply received within a month. Fifteen years ago, three to nine months would have been required.

Air mail rates are reasonably low when the remarkable service involved is considered. Over a few countries the postage rate is five cents for the first ounce, and this is increased gradually as distance increases until fifty-five cents per one-half ounce between the Argentine and the United States is reached. Air express rates are relatively somewhat higher, but the tendency is to reduce these charges. As the advantages of air express services become better known, it is certain that these rates will be lowered. Passenger rates vary, according to several factors, from four cents a mile on some United States lines to twenty-five cents on a line in Colombia. The tendency is to reduce passenger charges, though even now there is more economy in travel by air for many people than is generally realized.

Extraordinary demands are made on aircraft by some air services in the two continents. The longest over-water scheduled route, the highest regular flights and the extremes of temperature which prevail on single sections of some lines may be mentioned.

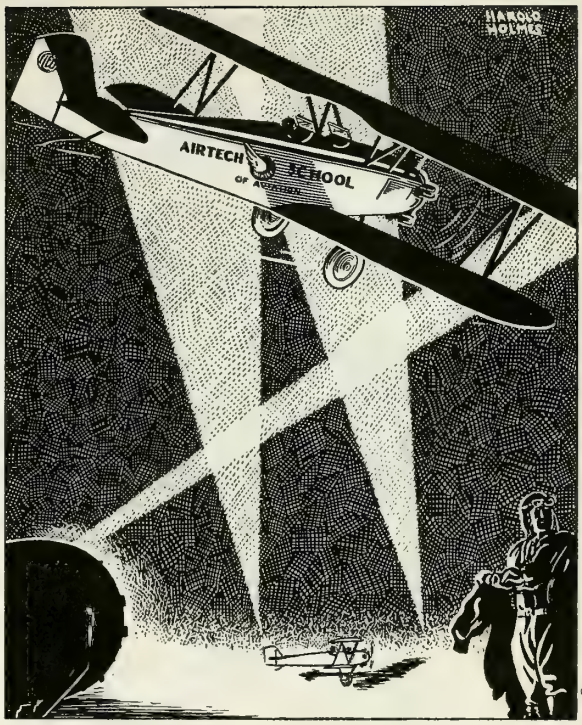
Practically all the night flying is done in the United States. Passengers, mail and goods are carried regularly over the backbone of the continent in large, comfortable planes in the middle of the night. Wide deserts, deep forests, long uninhabited coasts and vast snow-covered wastes are flown over by the clock throughout the year. It is believed that schedules are better kept throughout the Americas than elsewhere, and certainly they are maintained during all months when in other parts of the world there is often a curtailment or suspension of services.

These widely varied conditions call for specially suitable aircraft of the highest efficiency. In addition to the 500 airplanes in regular transport service in the United States, there are some 225 American planes in scheduled services in other countries in this hemisphere.

Some outstanding airports are in regular use, and the many hundreds of others are being improved steadily. Weather reporting services are not adequate in some places, but improvements are planned. Airway development has been carried further here than elsewhere, and communications facilities are at least equal to any.

A satisfactory portion of the air traffic of the world is carried on air routes in American countries and all forms of the traffic are increasing faster here than anywhere else. It is estimated that the number of passengers carried in the United States in 1930 increased to 450,000 as compared with 173,405 in 1929. The amounts of mail and express carried in the United States alone in 1930 are estimated at 2,000,000 and 8,000,000 pounds, respectively.

The factors favoring increased air transportation, together with the progress made during the last several years, indicate that the two American continents will be more and more closely linked and better and better served by air.



You will fly at night

while learning to be a Transport Pilot at Airtech School of Aviation. This advanced instruction, so essential to your success in aviation, illustrates the thorough training awaiting you at Airtech.

Experienced instructors with a total flying background of over 10,500 hours at the stick, will give you personal instruction in every phase of skillful piloting. A fleet of modern airplanes provides the opportunity to master each type of present day aircraft. Thus at Airtech, equipment and personnel have been welded into an efficient training organization with but one purpose: to give the finest aeronautical education that can be given.

Send the coupon for your copy of Airfax. It will bring you complete information about the five courses available at the first Western school to receive COMPLETE Department of Commerce approval.

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The Nassau Air Service Corporation conducts a passenger service at moderate rates; also a "Fly-Yourself-Service" for licensed pilots.

ECONOMIC AIRPORT OPERATION

(*Continued on page* 191)

push rods unless he wants to. It is gratifying that most present-day airports are improving along this line and making these jobs, at least, unnecessary.

The up and coming airport will also give a little more thought to its weather bureau than has heretofore been given. The weather bureau, just like any other part of the port, should strive to please—even to the point of being sorry it cannot change the weather. Traveling from coast to coast at the present time, one is amazed at the number of weather bureaus which seem to be imbued with the idea that their main duty is to collect data, make beautiful isobaric maps, keep a lot of records and talk of their theodolites, anemographs, psychrometric readings, pressure gradients and so forth. When a pilot walks into a weather bureau, that isn't what he wants. Usually he only has a vague idea of what all those things mean. But he does understand and appreciate courteous attention, and especially a written report of the weather he can expect in the direction he happens to be going. Such a report together with a bit of verbal information goes a long way toward making him have a friendly feeling for the particular airport. He should be sent away thinking: "Those fellows are what I call gentlemen; they can't help it that the weather's bum!"

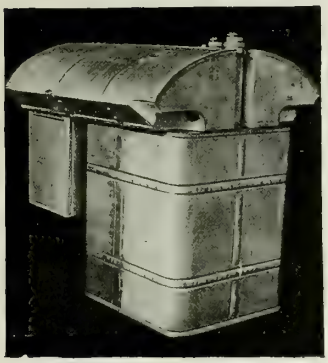
Of course, you may say, "What has all this to do with airport economy?" Only this, that at the present time very few airports are paying, directly. Considered as a whole, private ports probably come nearer than do municipal projects, because of the fact that they are not established except as their backers believe they are worthwhile or will become sources of revenue. How then, shall the municipal port be considered? What is its justification for being?

Perhaps the most sensible way to think of the municipal airport is to regard it as a public convenience, just as are roads and parks, a project which at least for the present cannot be expected to show much, if any, direct profit, but which has an indirect value that the community cannot afford to be without. If this view is taken, then the goal for which the administration should strive will be the establishment and operation of an airport which will reflect the greatest amount of credit to the municipality at the smallest expense and, it is hoped, will in the future be self-supporting or a source of direct profit.

Aviation is just beginning to get established. The "flivver" of the air has not yet arrived. Upon how this fast-growing and useful means of communication and transportation is now conducted will depend its ultimate safety and utility. The Department of Commerce through its Aeronautics Branch is performing a wonderful work in the regulation and aid which it gives. It is the duty of private enterprise and municipal organization to do their part too in aiding the cause.

Just as student training at Kelly would not have been a success without the requirements adapted to it, a good field, equipment and coöperation, so only will the airport of today be a success as it is well situated, constructed, equipped and managed. Airports cannot very well exist without airplanes, but more important, an airport cannot become a center of air commerce unless it is justified, has adequate accommodations, and is managed with proper care for its patrons—yes, and supporters—making it a place to which planes are welcome and at which their owners will find the things they need, the conveniences which they have learned to expect, and the friends they hope to meet.

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- ☐ Air Transportation Engineer
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What are the BIG PAY jobs in aviation? We have listed at the left some of these jobs—jobs that need trained men. Aircraft manufacturing and air transportation are calling men to fill these places, where real money is to be made.

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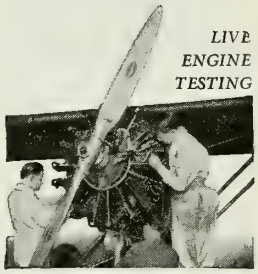
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AIR—HOT AND OTHERWISE

(*Continued from page* 44)

ports would be entered. Yet when the problem opened the combined striking strength of the defense fleet was immediately dissipated, divided in two, and half of it sent on a wild goose chase down to the Galipagos Islands, where the framers of the problem never had any idea of sending any portion of the enemy fleet. But this maneuver, inspired by whom no one at this time seems to be able to tell (or cares to), left *one single carrier,* the *Saratoga,* to fight the whole enemy fleet.

I happen to know, as a matter of fact, that the official referees and umpires of the war game who were permitted to know all the secrets of both sides were absolutely flabergasted when they heard that Admiral Willard had approved dividing his striking force in this manner. There was no enemy at Galipagos Islands. I do not believe that Admiral Joseph Reeves thought the enemy was there. Searching for a reason for this strange maneuver, we find a weak and startling apology for it by the participants. The *Lexington* was deliberately sent out of the scene of war because those in authority to dispatch her were made afraid of the state of mind of the General Board. How the power for this fear was projected I do not know. Through what channels it was sent can probably never be traced, and if it were so traced, I doubt the value of the detailed proof. Nevertheless, it is a fact that those charged with maneuvering the carrier aircraft strength in the recent Panama maneuvers were afraid to accept success by keeping a compact striking force, but preferred to attempt the almost impossible task with one carrier, and sent the *Lexington* on the vain chase, out of fear for one rhetorical question which was prepared for hurling at the General Critique: "No, of course the enemy was not at Galipagos. BUT, GENTLEMEN, WHAT IF THEY HAD BEEN?" It was to avoid the promised embarrassment—a threat if you are frank enough to call it such—that the striking force was divided, and the so-called gracious gift of an opportunity to test aircraft was destroyed.

In view of these handicaps is it little wonder that the defense victory by aircraft was as hazy and indecisive as it was? But there is still enough of proof in the situation to answer Admiral Pratt's trumpet tooting for the so-called "backbone of the Navy." Let us assume that the defense had been built around two battleships, that at the opening of the war one of these battleships had been told to go chase itself and take a walk around the block, what sort of a fight would the remaining battleship have been able to put up against the incoming Black Fleet composed of many battleships, eight-inch destroyers and a whole transport train of scattered vessels?

PRECEDENTS FOR THE EXPORTER

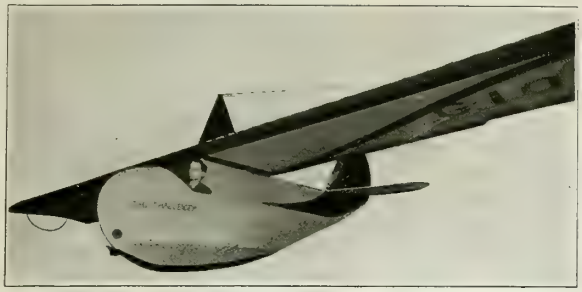
(*Continued from page* 36)

"orphan" without spares or available services to any foreign point.

In the matter of financing exports, automotive precedent has been of the utmost value to aeronautical manufacturers. Automobile men taught foreign distributors, after several years of concentrated effort, the value of the sales franchise and the necessity of paying for goods either in advance or on arrival. The aeronautical industry is now in a position to offer its products in export for cash only and has been able to establish this basis of trade as a result of the training of foreign distributors by the automotive group.

(*Continued on following page*)

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More new models of aircraft are scheduled to be announced at the 1931 National Aircraft Show at Detroit, than at any other previous exhibition! Although manufacturers are cloaking their offerings in secrecy, it can be safely forecast that a host of light planes of new design will be shown to the public for the first time. Come and see these "mystery ships" which bid fair to revolutionize the aircraft industry!

In contrast to the "midget" ships, there will be on exhibition some of the largest, as well as the fastest, planes built today. All the latest in aircraft accessories will also be on display. And the Detroit City Airport where the exposition will be held is a "show-place" in itself.

Surely, the 1931 National Aircraft Show offers an unusual opportunity to note the progress which has been made in aviation during the past year. The only aircraft show to be held in 1931, it promises to be the greatest ever organized. Remember the dates — April 11 to 19, inclusive. Take-off in time to attend the impressive opening!

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(Continued from preceding page)

The scientific sales data and statistics collected on various territories by the automotive manufacturers have been of inestimable help to the aeronautical industry. This material—which includes the consideration of the type of terrian, gross population, wealth per capita, etc.—is being used in the same manner by the aeronautical industry as it was by its predecessors in determining sales quotas and possibilities. It is safe to say that, before a scientific analysis of markets by the automotive industry had been made, all export markets were considered just foreign and sales efforts expended in different parts were entirely by "rule-of-thumb." By the same token advertising formerly placed hit or miss in a wasteful manner has been guided by scientific principles, and through its years of experience, the automobile trade has been able to teach aircraft exporters how to place their advertisements to obtain the greatest benefits without unwarranted waste and expense.

Some time ago, when two of our larger automotive companies branched into the aeronautical field, it was felt by those on the outside that they would immediately use their foreign automotive sales organizations for the promotion of their aeronautical export markets. I discussed this point with sales managers of automotive exporters and they assured me that it was felt there is such a definite fixed value in a successful automotive distributor that they would not dare tamper with his present sales ability by asking him to take on an aeronautical line which to him is practically foreign. From this it is quite evident that companies manufacturing both automobiles and airplanes are endeavoring to differentiate sharply between the two in building up their foreign sales organizations.

The foreign organizations of our automotive manufacturers are perhaps today as perfect as the varying conditions would ever allow them to be. There is no business organization which has to consider so many variables—psychological, financial, climatic and others—as an export organization, and there is no group which has met conditions as successfully as the automotive exporters.

Aeronautical exporters can certainly learn a tremendous amount from the experiences of the automotive manufacturers, but this does not mean that they are freed from all experimentation or that they can follow identically in the paths already laid out. Nevertheless, it is certainly true that a careful study of the last twenty years' experience in the exportation of automotive products cannot fail to be of great value to any exporter of aeronautical equipment.

EVOLUTION OF THE PILOT

(Continued from page 43)

Allies at bay for years; their armies made no progress—except backward in the spring of 1918. The publicity bureau of the Allies wore out the old release. "Our troops have advanced six inches on a two-yard front, and then were forced to fall back after inflicting heavy damage on the enemy."

In desperation, our publicists, hoping to boost public enthusiasm and confidence, hunted around for the one part of the war that had any movement in it—and found the war in the air. Ha-hah! What have we here? Captain Robinson shoots down a Zeppelin? Excellent! Give him the V. C. And here is a young pilot named Ball who shot down a flock of enemy planes. Give him a V. C., too. Publicity! Publicity! And something to hang it on, brother. Hang it on the only boys in the whole war who are able to move around and who aren't stuck in the mud like all of the army, or in Scapa Flow, like the whole of the navy.

(Continued on following page)

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Brace every ship you build or fly with

Hartshorn Est. 1860 **AIRCRAFT TIE RODS**

STEWART HARTSHORN CO.
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(*Continued from preceding page*)

Thus did the pilot, who started as a civilian show, even a freak, become a military show, and absolutely unique in that he was able to skip about. And thus did he become a hero, by the grace of God and the Allies' publicity department. As a matter of cold analyzed fact, it takes no more courage to go up and fire a few rounds of tracer into a defenseless gasbag than it does to stand day after day in a wet trench, expecting every day that someone will crawl over and wallop you over the head with a hand grenade or stick you with a bayonet.

However, thanks to the need to hang publicity on the only moving spectacular thing in the war, we returned heroes, the more fortunate of us covered with decorations, and all of us covered with glory. Is it any wonder that many of us said, "Verily, we are not as other men. We are men apart; move over and give us room on that pedestal."

And so we stood for a short time after the war, until we noticed that nobody was handing any grub up to us. So down we stepped and got back into the good old show business again, the air races, the flying circuses, the stunt performances, and all the rest of it. Our evolution had merely carried us around in a circle.

Meanwhile the old pilots whom we had left back in the factories, assisted now by trained engineers and the mechanical advancement of the gasoline motor made possible to a great extent by the automobile industry, were turning out airplanes that could go up higher, stay up longer, take more up, and bring it down more safely than heretofore had been possible with our airplanes even of the war. So with a loud blast on the good old publicity trumpet again, off we all started into commercial aviation. Everything was changed except the psychological attitude of the pilot; deep inside him, he was still a show, still a returned hero. The new pilots took an admiring look at him and tried to be just like him.

Then came Lindbergh with the most soul-satisfying emotional show the world has ever seen, though he didn't suspect it. That courageous Child of Destiny simply liked flying, wanted $25,000, and went after it in the only way he knew how to get it. Everything else of the gorgeous show was supplied by the active imaginations of the public, including millions and millions of dollars for aviation.

Not only the public but also many of the pilots caught Lindberghitis. They leaped into airplanes and went places—often into the middle of oceans, accompanied by ladies with powder puffs and publicity complexes. At last the exhibitionist of the old days, the hero of the war, the circus performer after the war, was coming into his own. Clash the cymbals, beat the drums, and hand him the key to the city and a luncheon at the Chamber of Commerce! We simply broke out in a rash of heroes, and rash heroes. There were too many of them, and we began to forget their names. Next we forgot where they'd been. Later we didn't give a hang. Pretty soon if anyone mentioned them we said, "What of it? Who cares?" Then came the market crash, we stopped being rich, and had other things to worry about.

And now let's look at the old pilot, the old-timer, who has been flying for ten or fifteen or more years, the fellow who has not grown rich off an ocean or made a killing on the market and got out in the summer of 1929. Where is he? And into what has he evolved?

Well, to tell you the truth, he's still flying, and the wind is pretty well squeezed out of him. You see, he has lived through all this stuff himself and has come to the conclusion that nearly all of it was wind and vaporing. He has per-

(*Continued on following page*)

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formed for the crowd, and has come to the conclusion that the eats have been pretty well knocked out of the circus games in the air. He has, probably, been through the war, or at least on the edge of it, and has come to the conclusion, just as I have, that we lads weren't super men at all, and that most of us weren't any braver than military necessity demanded that we be. Even if he has flown across an ocean or has had his name in the papers, he very probably has come to the conclusion that chewing old newspaper clippings is a dry and unnourishing exercise.

However, he gazes around him at the aftermath of all this hectic confusion. He sees the progress we made with design during the war; he sees the progress we have made after the war; he sees the public beginning—just beginning—to use the air as a medium of travel. And he says to himself, "Why, hanged if this here queer game ain't becoming a business, after all!"

And he is a pilot—a PILOT. He knows his profession and has an understanding of it that only long experience can give. He knows when to fly, and—more important—he knows when not to fly. He is fitted, by long experience, to merit the same measure of confidence and responsibility in the cockpit of his airliner as the captain of an ocean liner is fitted to command on the bridge of the steamer. In short, he has evolved into a finished pilot.

What is far more important than his perfection in matters technical is the fact that as a pilot he is mentally adult. He has learned that caution, and not Gertie's garter carried near his heart, will bring him "luck." In fact, he will know that "good luck" is usually the reward of knowledge, and "bad luck" the wages of ignorance. He is all through showing off, all through being "a brave fellow," all through risking his neck and his employer's property to prove that he is hot stuff. In fact, he isn't nearly so hot as he used to be, and looks with mingled pity and annoyance at the newer pilot who is eager to prove himself superior to the elements and the laws of gravity.

And it is this wise old bird who has made aviation. Of course the war helped him; the manufacturer helped him; the business man in aviation helped him; and the Government helped him to a very great extent. But it was this old bird and his companions who got out and actually flew the airplanes. They flew when there weren't any salaries to speak of, no airways, lighted or unlighted, not even much of a future that more than a few could see. And they stuck at it, in summer and in winter, through sunshine and rain, through warmth and cold, through brief moments of prosperity, through long years of hardship and adversity.

They flew when flying was dangerous, when airplanes and engines were uncertain quantities. And they are still flying, when flying at last may truthfully be said to be reasonably safe. And they are hoping—they were always great hopers—that now they may settle down to the lucrative enjoyment of the profession they have founded. Surely, if any group of men are entitled to a reward for their long years of toil and danger and privation, these old experienced pilots are the men.

Frankly, my friends, these words were written to call more attention to the worth of the old pilot, the very experienced pilot, the man who really *knows* his job. Outlined against a background of splendid accomplishment stand these men whose courage, whose high endeavor have given America its aviation of today. As a group, they have profited nothing in the distant past, and but little in the immediate past. It is my hope that they may profit to a greater extent in the future of this profession that they have built, and whose standards they have maintained with such courage and devotion.

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Bradley Jones is Professor of Aeronautic Engineering at the University of Cincinnati—and was for seven years Navigation Engineer at Wright Field.

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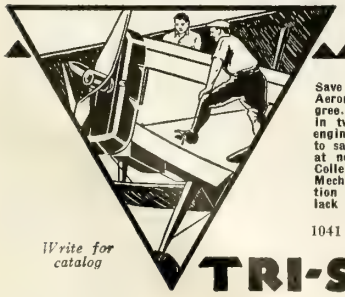
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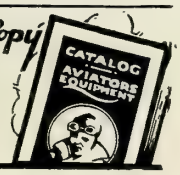


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FOR SALE—AIRPLANES, The best buys in the United States. Two J4 Whirlwind Wacos, new last Spring, and one J5 Whirlwind Waco. All with steel propellers and Heywood air starters. One OX5 Waco 90, also two OX5 Travel Airs. These ships were recently licensed and are priced to sell quick. Terms to responsible buyers. Write or wire Becker-Forner Flying Service, Inc., Jackson, Michigan.

FOR SALE OR TRADE, two J5 Wright Whirlwind motors same as new, completely overhaul by Wright Service, no time since overhaul, Hamilton propellers and Eclipse Inertia Sta Price $1200 each. Will consider trading on good licensed airplane. Write or wire Mic Aero Motors, Jackson, Michigan.

FOR SALE, WACO 10, OX5, condition like Never abused or damaged. Always kep hangar. NC license, $1650. Nemmers Brot Dell Rapids, South Dakota.

VELIE MONOPREP, like new, flown 63 hou with brand new motor, $1,400. Also Monocoup "90" demonstrator with completely rebuilt motor and OX5 Waco 10. Both in best of condition and priced right. Mohawk Airways, Inc., Albany, New York.

SPECIAL 1929 AMERICAN EAGLE, privately owned, never damaged, beautiful job; extras galore; act quick. $1275 with Millerized OX. Carl Hanson, American Eagle Distributor, Hubbard, Ohio.

At Curtiss Caldwell airport, Commandaire open biplane, three seater, dual control, rebuilt Warner Scarab engine. Splendid condition. H. W. Crowell, Globe Indemnity Co., Newark, New Jersey.

FOR SALE: Wright J5, no time since complete overhaul; also Eclipse electric inertia starter. Skyways, Boston Airport, E. Boston, Mass.

AIRPLANES $500 UP. We have airplanes in every state. Write your needs. No doubt we have just what you want at the price you want to pay. Pioneer Airplane Sales Service (20 years in aviation), Airport, Syracuse, New York.

FOR SALE: Waco Straight-Wing, Wright J6-7 Demonstrator, just like new; License NC673N, only 40 hours. Cost $8,000, will sell for $5,000. Special paint job, red and black fuselage, gold wings. Heywood starter, brakes, complete instruments. The Little Greiner Flying Service, Inc., Municipal Airport, Springfield, Ohio.

FOR SALE: Challenger Robin, C9278, excellent condition, complete instruments, and night flying equipment, $3,000. OX5 Robin, NC959K, only 40 hours, excellent condition, $1,500. Model A2 Hisso motors, complete, new condition, $185 each. The Little-Greiner Flying Service, Inc., Municipal Airport, Springfield, Ohio.

FOR SALE: Ryan monoplane, J5 motor, full set instruments, landing lights; in perfect condition, never cracked; motor had only 200 hours. Must be sold at once. Offered at $2,500. Greenwood Flying Service, Vancouver Airport, Vancouver, Washington.

LICENSED Kinner Eagle; never cracked up; forty hours since top overhaul. Priced for quick sale. Frank Richied, 313 So. Seventh Street, Bismarck, N. Dak.

FOR SALE: J5 Whirlwind Waco pontoon Seaplane, new last year, with Edo pontoons, Heywood air starter. Ship can be licensed on land or water. Becker Forner Flying Service, Inc., Jackson, Michigan.

FOR SALE, one J5 Wright 220 H.P. rebuilt motor, one set Goodrich Air Wheels with brakes 30x13—6". Reliable Flying Service, Inc., Watertown, Conn.

ATTENTION BARGAIN HUNTERS; New production, used airplanes open and closed types, as low as $600 up to $10,000. Write for a list. Jack Smoligan, 2520 L Street, Omaha, Nebraska.

FOR SALE: Verville four-place cabin airplane in perfect condition with Wright 225. Ship just relicensed and motor completely overhauled. Write Box 988, Wichita, Kansas.

OX5 CANUCK with dual controls, never cracked up, newly covered, flies wonderfully. Very cheap. Dandy to put in hours on. F. B. Irvine, Linton, North Dakota,

FOR SALE: OX ROBIN, A1 condition, total 130 hours. Flown only by owner. Make offer. Selling on account of position. Licensed. AERO DIGEST, Box 1134.

FOR SALE: Waco airplanes, both new and used. Free flying instruction on any Waco purchased. See us before you buy. Waco distributors in entire Northern Ohio. Robbins Flying Service, Akron, Ohio.

FOR SALE: Curtiss Fledgling with Challenger motor, had 86½ hours in air. Complete instruments in both cockpits. Air Wheels. Cost $12,000 new, eighteen months ago. Price $3,400. AERO DIGEST, Box 1124.

LOW PRICES, used aircraft of quality, all licensed and in excellent condition. Six Kinner Fleets, two [illegible]er Universals, two J5 Eaglerocks, J5 Four- [illegible] coach, two J5 Dusting planes, two Lib [illegible] mpletely reconditioned [illegible] like new. Prices [illegible] Cor- [illegible]

[illegible] red [illegible] at [illegible]d Canyon, [illegible] Ari[illegible] ion. Write, wire or phone John J. Meinel, Jr., 9568 Bessemore Ave., Detroit, Michigan. Lincoln 9023-R.

STUDENT wishing Transport License, $500 cash and work out the balance (spare time) while taking your time. Only one student accepted on this proposition; better hurry. Highway Aircraft Co., St. Joseph, Missouri.

MISCELLANEOUS

AIR STAMP COLLECTING: The ideal hobby for all interested in flight. Illustrated priced catalogue and guide, 70 cents post paid. Air stamps sent on approval. Stanley Gibbons Ltd., Dept. 126, 391, Strand, London, Eng.

HAVE BUILT my own type, twin motor powered, all steel welded monoplane. Span 28 feet; total weight empty 300 pounds. Want a few members to form a club for sport flying and building our own planes. Write R. Stepanich, 147 Drive, Rosedale, L. I.

JUST PLANE PHOTOS. Make money selling the Stiles' original plane photos. Young agents, or dealers, wanted on every airport; also clubs and schools. Ask for dealer's prices. 75, all makes, 7 x 10; 3 for $1 COD plus postage. Guaranteed. Send for list. John Stiles, Stoughton, Mass.

TRADE 28 MODEL A Roadster, good condition for sport plane, two place preferred. Must fly delivered to Studley, Kansas. Lester Corning.

WANTED TO TRADE—Karikeen two-place cabin ship, in fine shape, for two or three place open job. Will pay cash difference for good ship. Labette County Community High School, Altamont, Kansas.

HAVE APPROVED stress analysis and drawings for three place, dual side by side control, high wing, cabin Coffman monoplane, for sale or trade for ship in class of Lockheed. Sam. H. Coffman, 1907 S. W. 15, Oklahoma City, Okla.

LIGHTPLANE OWNERS and Builders; now it is possible to build or assemble our own Lightplane motor. The St. Louis Dart 2 cylinder, 2 cycle, 23 h.p., 52 pounds. A tested and proven engine. Complete set of castings and forgings, $45. Or three kits, $16.50 each. Send 10c for catalog of everything for the Lightplane. Lightplane Supply, 5523 Cabanne Ave., St. Louis, Missouri.

WANTED: Operators on percentage for an approved airport, located just outside of New Haven, airport frontage on the Boston Post Road. One of the most highly traveled highways in the country. Good crowds for passenger hops, student training, etc. For details address P. O. Box 1747, New Haven, Conn.

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INVENTOR'S UNIVERSAL EDUCATOR. Contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price $1.00 postpaid in U. S. A. Address Dieterich Co., 602-C Ouray Building, Washington, D. C.

PATENTS—Airplane cases solicited. Reliable service. Experienced practitioner devoting personal attention to each case. B. P. Fishburne, Patent Attorney, 589 McGill Building, Washington, D. C.

FOR SALE

FOR SALE CHEAP: Two 30x13 Goodyear Doughnuts (tires). Hubs and Brakes in first-class condition. Amphibions, Inc., Garden City, N. Y.

FOR SALE: New inverted in-line Argus engine, four cylinder, air cooled, 80 HP, 1930 model AS8. The foremost European light engine. Brand new in crate, $750. Menasco Motors, Inc., 6718 McKinley Avenue, Los Angeles, California.

FOR SALE: One set new metal pontoons. Reliable manufacturer. 3500 lbs. displacement. Each float weighs 230 lbs. Fittings will be furnished to suit ship. What do you offer? Write or wire Bellanca Aircraft Corporation, New Castle, Delaware.

CURTISS MOTORS: For immediate disposal, a limited number of new OXX6 and government rebuilt OX5 and OXX6 motors way below market prices. All motors in original government boxes and have not been used since purchased directly from the government. Also new spare parts. Get our quotations. Aero Motor Sales Co., 500 East Jefferson, Detroit, Michigan.

BRAND NEW OX5 motors in original crates only $178.50 each. Quantity available limited. Only one sold to a customer. Offer subject to withdrawal when stock is exhausted. Karl Ort, York, Penna.

BUILDERS; New 80 HP LeRhone motors, $35. Parts at lowest possible prices. Stamp for price list. Box 514, Johns Hopkins University, Baltimore, Maryland.

FOR SALE: Brand new Dayton Bear motor, special show job, complete except magnetos. Many extra parts, such as cylinders, crankshaft, valves, piston rods, etc. Make offer for motor, parts or both. AERO DIGEST, Box 1133.

FOR SALE: Travel Air wings, tail group, ailerons, fuselages, wing covers, Waco taper wings. Swallow groups, undercarriage. Instruments, Avian wings. New Commandaire parts. Gnome motors. New Primary glider. Miniature racing car. Wm. Raithel, 206 E. 35th Street, New York City.

SPORT PLANE fuselages, $25 and up. Motors $25, Wings $50, Props $5. Send dime for Sport Plane Supply Catalog. Marsh & Cendt, Colby, Wisconsin.

THE LARGEST Magneto dealer in the world offers you Scintillas, Dixies, Simms and other airplane magnetos at one-half the price you will pay elsewhere. Charles Stern & Company, 817 Washington Blvd., Chicago, Illinois.

NEW PRODUCTION 30 x 5 Kelsey Hayes heavy duty wheels, $10 each. Airplane Sales & Service, Port Newark, New Jersey.

FOR SALE: New Wright J6-5 165 horsepower engine, complete with accessories. This engine still in original crate. $2,050 cash. James B. Ford, Box 974, Tulsa, Oklahoma.

FOR SALE: Parts for Fairchild model FC2. Wings, tail group, landing gear, also body parts. Soo Skyways, Inc., Sioux Falls, S. Dakota.

TURNBUCKLES, 10c. Fuselage fittings, 25c. Book containing blueprints, plans, etc., $1. Bargain price list on sportplane, glider supplies two stamps. Russell Aircraft, Box 455, Toledo, Ohio.

NEW WELDED HEATH Parasol fuselages with welded tail surfaces, $55 each. Heath Parasol ribs, $15 set. Primary glider, $40. Write Sportplanes Co., P. O. Box 121, Lexington, Kentucky.

FOR SALE: Low wing wood fuselage, wings and tail covered; complete with controls, tank, etc., $90 f.o.b. Alfred Roth, 1035 Chicago Avenue, Oak Park, Illinois.

AMERICAN EAGLETS, brand new, dual controls, Szekely engines, fully equipped ready to fly away, $1,000 each. AERO DIGEST, Box 1113.

STANDARD WINGS, FUSELAGE, D. H. Landing Gear, $50. LeRhone 165, $45. LeRhone 50, $40. Northrup type glider, flying or crated. $40. H. Fleming, Somers Point, New Jersey.

NEW PRODUCTION sport planes with split landing chassis, welded fuselage and tail group, completely finished ready to fly, only $395, motor extra. Send fifty cents for dollar value, pocket size leather bound flying manual and information. Hibbs, Fort Worth, Texas.

FOR SALE: Nearly complete mid-wing single place open monoplane; Henderson motor, wood fuselage, less wheels. Sell cheap or trade for light car. H. H. Brindley, Peabody, Kansas.

USED motors, propellers, hubs, etc., for lightplanes, boats, air-sleds. Harleys, Hendersons, Fords. Flying Flivver blueprints, $5. Landing speed 20 miles. Circulars, 10c. Storms Aviation Co., Spartanburg, South Carolina.

$25 buys a set of 26 ribs for your glider or lightplane, any size, any airfoil. Complete plans for gliders. Full size rib drawings, any airfoil, $1. Bargain price list on lightplane, glider supplies, 10c. Herbert A. Lear, 68 Broad Street, Salamanca, New York.

FOR SALE: New Wright J4 parts; 4 induction tubes, 4 complete cam follower assemblies, 6 push rods, 3 piston and rod assemblies, 1 con. rod, 2 complete cylinders, 2 cylinders, 32 outer valve springs, 25 inner valve springs. Airplane Sales & Service, Port Newark, New Jersey.

FOR SALE: OX-5 Travel Air wings, $85.00; control surfaces, etc. Standard J-1 wings $10.00. Many Standard parts. Roger Mensing, 1218 Jones Street, Fort Wayne, Indiana.

HEATH SEA-PLANE PARASOL—as stable as the famous land Parasol. Lands on any small river or lake. Leaves water in 8 seconds. Sturdy pontoons withstand hardest landings. Material complete only $228. $12 starts you building. Pontoons alone available for your land plane. Complete ready built $265. Or build them yourself for $69. Interchanged with wheels in jiffy. 10 cents brings illustrated booklet. Heath Aircraft Corporation, Dept. C1 35A, Chicago.

NEW HEATH B4 MOTOR—ideal power plant for your light plane. Absolutely free from bearing and vibration difficulties. Delivers 30 H.P. Costs only $300 including propeller hub. Re-manufactured Heath-Henderson motors also available as low as $190. In perfect condition. Fully guaranteed. 10 cents brings illustrated booklet. Heath Aircraft Corporation, Dept. C1 33A, Chicago.

HEATH PARASOL—winner of every American light plane event for past five years. Designed for beginners to fly. Remarkably easy to construct. $12 starts you building. Parts complete only $199. May be shipped in 11 convenient, progressive groups as needed. Clear detailed plans and instruction sheets explain every step. 10 cents brings large illustrated booklet. Heath Aircraft Corporation, Dept. C1 34A, Chicago.

FOR SALE: Aerial Camera, Eastman K5 with two perfect lenses and 20-inch and 12-inch interchangeable cones, capacity seventy-five 8 x 10 exposure film. Will sell at sacrifice, no reasonable offer refused. AERO DIGEST, Box 1123.

PROPELLERS for all light aircraft, boats and sleds. Let us quote on your requirements; performance guaranteed. Write Sensenich Bros., Lititz, Penna.

ONE NEW CLEONE Motor, price $150 for quick sale. Motor complete and is new. Freight prepaid. Sensenich Bros., Lititz, Penna.

DE HAVILAND GYPSY ENGINES, 3, rebuilt. Also Moth and Monocoupe parts, Warner Heywood starter, and small aero struts. Skyways, Boston Airport, E. Boston, Mass.

WANTED

WANTED: Immediately, one or two place plane, A-1 condition. Quote lowest cash price, describe accurately. John M. O'Leary, 122 Dix Avenue, Glens Falls, New York.

WANTED: Model F Waco Warner in good flying condition; give cash price and information in first letter. J. S. Zoldos, 6142 Frontenac Ave., Detroit, Michigan.

WANTED: A four-passenger cabin Amphibian (Savoia Marchetti preferred), in good condition. Write, L. Vines, 902-12 Ave. West, Calgary, Alberta, Canada.

PILOT to manage, lease or buy the best located airport and school in Vermont. New 4 ship hangar with workshop, service station and lunchroom; direct on state highway. Schill Airport, Milton, Vermont.

WANTED—licensed, used or slightly damaged low wing open or cabin, full cantilever light weight, high speed monoplane of sturdy construction, with or without radial motor of 300 h.p. or more. Wing spread 36' to 42', area, 200 to 300 sq. ft. J. Kull, 601 North 18th St., Philadelphia, Pennsylvania.

WANTED: Light Airplane in good condition at reasonable price. Jim Schimka, Box 12, Sunol, Nebraska.

WANTED, Motor and fuselage aluminum cowling complete or any part, for Waco 10 OX5. Must be reasonably priced. No bad dents. State price in first letter. Art Wright, 300 W. Bridge St., Austin, Minnesota.

WANTED: Wings for OX Waco 10, Miller overhead, propellers. Give lowest cash price. Brewster, 2618 East 27th Street, Brooklyn, N. Y.

WANTED: Cessna Warner. Give history, condition, lowest cash price. Might consider other cabin ship or amphibian under 200 horsepower if bargain. AERO DIGEST, Box 1128.

WANTED: OXX6 new or slightly used. AERO DIGEST, Box 1101.

MONOCOUPE WANTED: With or without motor. Must be in good condition and licensable. Give details. Harold M. Lake, Gettysburg, S. Dakota.

WANTED, One 35 HP Anzani Motor, dual Magneto, must be in perfect condition. Write, stating all details. Ernest Kremer, 30-82 8th Ave., Astoria, L. I. City, New York.

WILL PAY cash for set of Fleet wings covered or uncovered. Also wing struts. Must be bargain. R. L. Millhorn, Welch, West Virginia.

TRANSPORT PILOT: Over 3,300 certified hours, 700 on Wasp Fords and Sikorskys. Until recently with large transport company. Rated on all types; night and air mail experience; working knowledge of Spanish and leading European languages. Proven record; no crackups. Age 34, single and always sober; desires a responsible connection. AERO DIGEST, Box 1032.

POSITIONS WANTED

TEMPLE UNIVERSITY GRADUATE: BSC., transport pilot, Naval aviator, single, 23. After July 1st desires office or flying position with transport, mail, or oil company. Proficient in radio, accounting, office management and flying. AERO DIGEST, Box 1093.

GRADUATE PARKS Mechanic School, grade A recommendation, also high school. Desire connection with airport or factory in eastern U. S. Good character; references. Age 18. AERO DIGEST, Box 1092.

TRANSPORT PILOT desires position with reliable concern or individual. Classes 1A and 1C, and mechanic's license. Experienced in instruction, cross country and night flying. Age 25, married, best references. Available immediately. C. E. Callahan, 801 W. Oklahoma Street, Enid, Okla.

TRANSPORT PILOT: 500 hours, experience on open and cabin jobs. Best references. Will go anywhere. Would like to fly for some individual or company; will fly percentage. Herbert Rish, 406 S. Detroit St., Kenton, Ohio.

TRANSPORT PILOT: Open and cabin ship ratings, desires position with school or individual as flight instructor. Knows aerial navigation and meteorology. Good engine and airplane mechanic. Barnstorming and night flying experience. Excellent record. Working knowledge of Spanish, can read and speak Portuguese. Will consider South America. Transport, Box 92, Sheridan, California.

TRANSPORT PILOT: A and E license. Over 1100 certified hours—open and cabin planes. Two years aircraft factory experience. Several hundred hours student instruction. Barnstormed all over country. Have flown in all altitudes, mountains included. Excellent references. Willing to go anywhere. Chester G. Brown, Vroman, Colorado.

AERONAUTICAL DRAFTSMAN—Licensed airplane & engine mechanic, capable of taking full charge in either, or both positions. Good sales promotion record. Will work anywhere, available now. Will prove a valuable asset to manufacturer, flying service or private owner. Excellent references. Alfred J. Ozol, 17 Woodside Avenue, Jamaica Plain, Mass.

PARKS MCH. GRADUATE—hold highest student average, now manager welding shop. Can instruct welding, furnishing own equipment, or other ground courses. Half salary flying instruction or credit on plane. Clarke Byrd, 366 N. Prospect St., Marion, Ohio.

AIRPORT MANAGER—desires connection with commercial or municipal airport as manager. Must be permanent. Have necessary qualifications. Or, if you are interested in starting a school and have sufficient finance, I have a plan that would be very profitable. Write George Tegeder, 3101 S. Lafayette St., Ft. Wayne, Indiana.

ENGINEER & TRANSPORT PILOT; Experienced design construction and testing. 3000 hours all types, racing to Tri-motor. Army trained. Now in Kansas. Go anywhere. Speak some Spanish; married; excellent references. Refer to AERO DIGEST, Box 1132.

TRANSPORT PILOT: Flying since 1923. 500 hours on new production ships. Desires active flying position. Salary no object. Will work on any proposition that offers plenty of flying time. AERO DIGEST, Box 1131.

TRANSPORT PILOT: 350 hours; college education; one year barnstorming experience. Both open and closed. Best reference. Will go anywhere and consider anything. Age 25. William Shaw, Parkston, South Dakota.

CIVIL ENGINEER, 29, unmarried, University graduate, some flying time and ground course, desires financial assistance to complete flying training and to take aeronautical engineering course. AERO DIGEST, Box 1121.

A transportation company or airport can use this experience: Licensed private pilot, graduate Roosevelt Mechanics School, 6 months mechanical experience; two years Cornell University; two years office experience, aeronautical publication. Age 26, single, go anywhere. E. Lewis, 292 Clinton Ave., Brooklyn, New York.

POSITIONS WANTED

TRANSPORT PILOT, 800 hours, cross-country and instruction. Age 24. Will go anywhere. Best references. At liberty after February first. Box 173, Viborg, S. Dak.

SALESMAN, young, experienced, desires connection. Over 4 years experience selling electrical specialties and automobiles. Planes in $12,000 to $24,000 class preferred, but will consider anything. Single and free to go anywhere. Inquiries invited. AERO DIGEST, Box 1104.

U. S. RESERVE OFFICER, age 34, single, over 800 hours, all types planes. World War pilot officially accredited with four German planes. Technical graduate with several years' engineering experience. Prefer flying or engineering positions but will consider a connection of any kind in aviation. AERO DIGEST, Box 1071.

WANTED—Work about airport, theoretical and practical knowledge of airplanes and motors. American School of Aviation graduate, age 26. write, John Cooney, Oswego, Illinois.

EXPERIENCED WELDER—Instructor, inspector and general aircraft rebuilder, with own equipment desires connection with responsible party or parties. Member S.A.E. For details and particulars write immediately. AERO DIGEST, Box 1105.

BUSINESS GETTER desires connection with competent flying service doing conventional forms of flying. Also to commercialize on new forms of profitable flying. Considerable education; experienced in commercial aviation. Unmarried; sober. Prefers commission compensation. Success assured. AERO DIGEST, Box 1108.

YOUNG MAN—19, desires work with future with transport company, factory, distributor or any branch. Graduate Aviation Institute of U. S. A. Go anywhere. AERO DIGEST, Box 1106.

GRADUATE American School of Aviation desires connection on airport or in aircraft or engine factory. Willing worker. Will accept small salary to start. Herman J. Voss, Box 511, Pomeroy, Iowa.

TRANSPORT PILOT, 3000 hours. Ex-mail pilot, day and night flying. Best of references. Pilot, 700 W. Walnut St., Blytheville, Arkansas.

YOUNG MAN—19, desires position with fair promoter, exhibition company or barnstormer, as chute jumper, wing walker and ladder performer. Experienced jumper and walker. Apt learner, eager and interested. High school education. AERO DIGEST, Box 1111.

TRANSPORT PILOT, Licensed Mechanic. Needs work at once. 500 hours cross country, barnstorming, student instruction. Open and closed ships. Three years airplane service work. Age 25; best references; will go anywhere. AERO DIGEST, Box 1112.

MASTER A TRANSPORT PILOT with over 5800 hours, desires position with either reliable airline or as personal pilot to individual owning or contemplating purchasing large multi-motored seaplane or amphibian. For full detailed biography see PersonAIRlities, this issue. Birger Johnsen, 75 Fifth Avenue, New York City.

TRANSPORT PILOT—700 hours on open and closed jobs, experienced in instructing, barnstorming and cross country flying. Have A and E license. Very conservative, sober and willing worker. Single, age 28. Best reference. E. E. Ace, Hemlock, New York.

TRANSPORT PILOT: 26, seventeen hundred certified hours; five hundred on Wasp Fords; line experience, also instruction and test pilot for well known factory; executive and sales experience. Desires responsible connection. AERO DIGEST, Box 1115.

TRANSPORT PILOT: Over 2,500 hours. More than 8 years' experience on all types planes and engines. Experienced operations manager with much cross country flying. Licensed airplane and engine mechanic. Will accept co-pilot job on tri-motor if chance for advancement. Best of references. Will go anywhere. AERO DIGEST, Box 1118.

YOUNG MAN, 18, two years college, one year engineering, experienced draftsman, desires position with firm or individual. Will work hard for small salary and aviation instruction. AERO DIGEST, Box 1117.

L. C. PILOT, 100 hours, Universal trained, open or cabin. Private owner connection preferred. Care of own ship. Age 21, best moral references. Wages secondary; available April or May. Go anywhere. W. A. Roberts, 27 S. Poplar St., Mt. Carmel, Pa.

TRANSPORT PILOT, 14 years experience in flying. Am single; can furnish best of references as to executive and sales ability. Will go anywhere. AERO DIGEST, Box 1119.

TRANSPORT PILOT, 775 hours, 5 years' experience flight and ground school instruction, airport management, etc., 28 years old, married, go anywhere. Salary not chief consideration. Address, Manager, Detroit Lakes Airport, Detroit Lakes, Minn.

ENGINEER, thoroughly experienced in drafting, design and stress analysis. Recently completed entire drafting of new cabin plane. Have never had to redraft any material. All material submitted to Department of Commerce accepted without rejection or question. Excellent references from present and previous employers. Married, prefer location in East. G. F. Burnett, 510 N. Benton Ave., Marshall, Missouri.

TRANSPORT PILOT wants job; approximately 3,500 hours as instructor and cross-country pilot. Sober and hard worker; will go anywhere. Licensed A & E mechanic. Can overhaul all types ships and motors. Will accept anything with a fair salary. What have you? Pilot, 105 Norwood Ave., Lodi, New Jersey.

WANTED, job at airport by high school graduate. Age 18. References. Go anywhere. Can start about June 20. Harold Ladwig, R. 4, Woodstock, Illinois.

PARACHUTES

PARACHUTES: Approved type. Seat, back, lap and chest, bought, sold, exchanged, repaired. Tell all first letter. Professional parachute jumpers and ballonist furnished for all occasions. Thompson Bros. Balloon & Parachute Co., Aurora, Illinois. Established 1903.

GLIDERS

TRAINING or exhibition flying, light weight glider. Excellent performance, condition. Wheel landing gear. Tow flies by hand or car. Price $150. Carl Duede, Stuart, Iowa.

NATIONAL MODEL CONTEST

DAYTON, OHIO

FOUR CONTESTS—*Every young man under 21 may compete for one or all four prizes*

FOUR model airplane champions will win free airplane trips to Washington, D. C., this summer as the guests of the Ford Motor Company. They will be selected at the Fourth National Airplane Model League of America Contest to be held in Dayton, June 29th and 30th. To enter these contests you need only to join the A. M. L. A. and arrange to take part in the National Contest—and build a better flying endurance, fuselage, or scale model than anybody else.

There will be banquets, the champions' trip in a Ford trimotor to meet the President at the White House, sightseeing in Washington, and the return trip by airplane to Dayton.

Mark the dates on your calendar—June 29th and 30th! The cost of the trip is small, less than $15 above your railroad fare.

For full particulars write

Merrill C. Hamburg, *Secretary*, A.M.L.A., 300 Davis Avenue, Dayton, Ohio

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U. S. Aviation Underwriters

LICENSING ORGANIZATION
Autogiro Company of America

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Ideal Aero & Supply Company, Inc.
Miniature Aircraft Corporation

OIL AND GASOLINE
American Oil Company
Kendall Refining Company
Richfield Oil Company
Stanavo Specification Board
Standard Oil Company of New York
Texas Company
Vacuum Oil Company

PAINTS—VARNISHES DOPES—LACQUERS
Berry Brothers, Incorporated
Phenix Aircraft Products Company
Titanine, Incorporated

PARACHUTES
Switlik Parachute & Equipment Co.

PARTS—MATERIALS
(See also Aircraft Jobbers)
Hartshorn Company, Stewart
Hill Aircraft Streamliners Company
Nixon Nitration Works
Libby-Smith Manufacturing Company
Paramount Welded Aluminum Prod. Corp.
Pike-Dial Lumber Company

PATENT ATTORNEYS
Polacheck, Z. H.

PLYWOOD
European Wood Products Co., Inc.
Fleischmann Transportation Company

PROPELLERS
Hamilton Standard Propeller Corp.

RADIO
Racon Electric Company
Western Electric Company

RUSTPROOFING AND ALLOYS
Udylite Process Company

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Air Associates, Incorporated
Airtech School of Aviation
Bedford Y. M. C. A. Aviation School
Boeing School of Aeronautics
Chicago Gliding School
Coleman Electrical School
Columbia Tech School
Commercial Aeronautics
Curtiss-Wright Flying Service
Dallas Aviation School
D. W. Flying Service
Eagle Airways
Edgewater Flying Club
Leonard Flo Air College
Lincoln Airplane & Flying School
Ludington Phila. Flying Service
Major Leslie G. Mulzer
Marion McKeen Aeronautics
Marshall Flying School
Nassau Flying Service
National Air Transport, Inc.
Parks Air College
Ryan Flying School, T. C.
St. Louis Flying School
Solo System of Flying Instruction
Southern Airways School
Spartan School of Aeronautics
Stewart Technical Trade School
Tri-State College
U. S. Aircraft Engineering School
Von Hoffmann Aircraft School

SPARK PLUGS
A C Spark Plug Company
B G Corporation
Champion Spark Plug Company
Hurley-Townsend Corp.

TICKETS
Globe Ticket Company

TIRES
B. F. Goodrich Rubber Company
Goodyear Tire & Rubber Company
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TOOLS AND HARDWARE
Ex-Cell-O Aircraft & Tool Corp.
Norton Company

TRADE BOARDS
Detroit Board of Commerce
Los Angeles Chamber of Commerce

TUBING
National Tube Company

UPHOLSTERY FABRICS
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READY TO GREET THE SUN

The sun is up!...and members of the Spartan Dawn Patrol are ready for morning flight maneuvers where every day is a flying day.

It's easy to enter America's finest aviation school because tuition is low, terms are made to fit your circumstances, and your transportation is furnished from any city in the United States.

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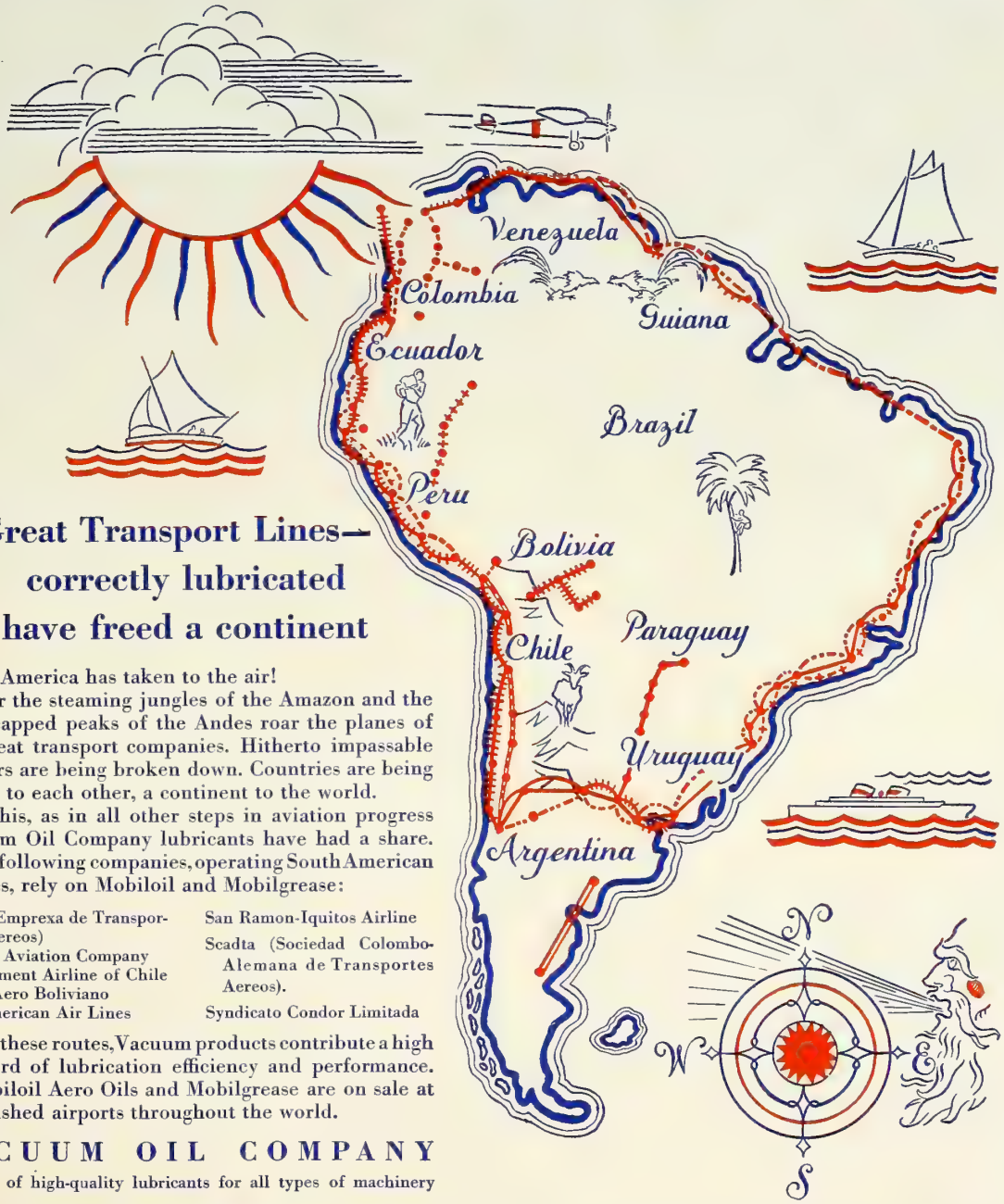


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AT THE DETROIT AIRCRAFT SHOW

★

Beyond question the largest and most elaborate collection of scale model airplanes ever exhibited here or abroad will feature Berry Brothers' exhibit at the National Aircraft Show in Detroit April 11-19. Models of many world famous ships as well as planes now being built by leading manufacturers will be on display. Unique and attractive Berryloid color schemes will adorn one type after another—giving plane owners and operators practical suggestions for the use of color on their own ships. Bring your questions regarding the finishing or covering of airplanes to our booth. Experienced representatives will be in attendance to discuss your problems. Berry Brothers, Inc., 211 Leib Street, Detroit, Mich. Varnishes, Enamels, Lacquers, Paints.

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Syndicato Condor Limitada

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MAY, 1931

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AERO DIGEST



AIR SHOW
in
REVIEW

RACING
AIRPLANES

LICENSING
of
AIRMEN



"WASP" ENGINES *fly from* HOLLAND TO JAVA



with the World's Oldest Air Transport Company

Acme—P. & A. Photo



This Fokker transport, powered with three Pratt & Whitney "Wasp" engines, is used on the famous K. L. M. line to carry passengers, mail and express between Amsterdam, Holland, and Batavia, Java, Dutch East Indies.

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THE WACO LINE FOR 1931



THE WACO line for 1931 includes a complete range of models to satisfy every normal requirement for private ownership and commercial operation.  The popular "F" series, still further refined, remains the backbone of the line... It was the outstanding new airplane design of 1930 and led all others in sales... It is available with Kinner, Warner and Menasco power plants... and also, in the "Model F-2", with Continental  165 h. p. engine. ● The "Model C"  is WACO's bid for leadership likewise in the field of cabin airplanes... Shown for the first time at Detroit last month, it was one of the sensations of the Show. ● At higher prices are the famous Wright-powered WACOs...  the stalwart "225" Straight-Wing and the spectacular Taper-Wing... holders of numerous records, consistent winners of countless air events. ● The price range is from $4450 to $8525... Heywood starters are standard equipment on all models... and WACO prices, as always, include *complete* equipment, flyaway, without any extras to be added. Full details on request.

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THE WACO AIRCRAFT COMPANY...TROY, OHIO. "ASK ANY PILOT"

KENDALL KEEPS UP WITH THE TIMES IN THE AUTOGIRO



The Autogiro over Miss Liberty in New York. (At top) James G. Ray, veteran mail and test pilot, who took the Autogiro on a series of public demonstration flights throughout the country.

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The Autogiro Company of America is not a manufacturing or selling company. It is solely an engineering and licensing organization. It owns and controls, exclusively, all Autogiro patent rights in the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full co-operation of our engineering staff. Present licensees are: Buhl Aircraft Company, Detroit, Mich. . . . Kellett Aircraft Corp., Philadelphia, Pa. . . . Pitcairn Aircraft, Inc., Willow Grove, Pa. . . . We are now prepared to arrange demonstrations to acquaint the industry with Autogiro principle, design and operation, and to discuss production privileges.

* *Italicized statements quoted from recognized authorities; names on request*

AUTOGIRO

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Characteristics . . . The Autogiro differs basically from all other heavier-than-air craft in the source of its lifting capacity. This lift is given primarily by four rotating blades which take the place of the familiar wings of an airplane. There is no time when this supporting rotation of the blades can be stopped while the machine is in the air, as their motion is produced solely by wind pressure caused by the movement of the Autogiro in any direction, climbing, level flight, gliding or descending vertically. The supporting rotation of the blades is entirely independent of the engine, whose sole function is to propel the Autogiro.

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AUTOGIRO COMPANY OF AMERICA
LAND TITLE BUILDING . . . PHILADELPHIA

Above: AN AUTOGIRO OVER MIAMI — — ABOUT TO LAND IN BAY FRONT PARK. *Below:* AFTER LANDING IN THE PARK.



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(*Patented in the United States and Other Countries.*)

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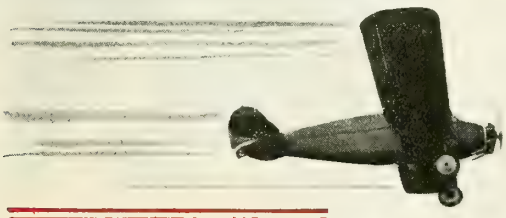
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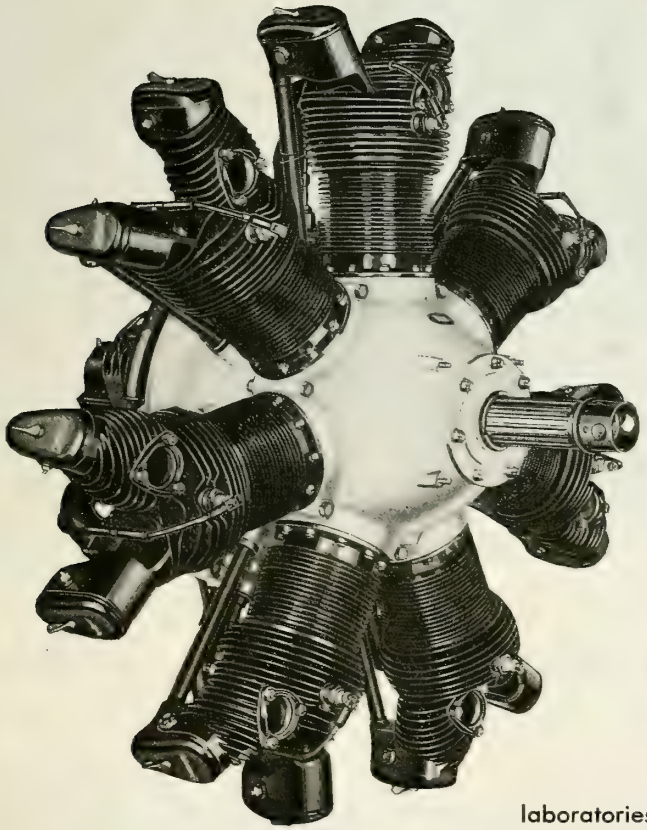
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for the airways of America



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Photo by Underwood and Underwood

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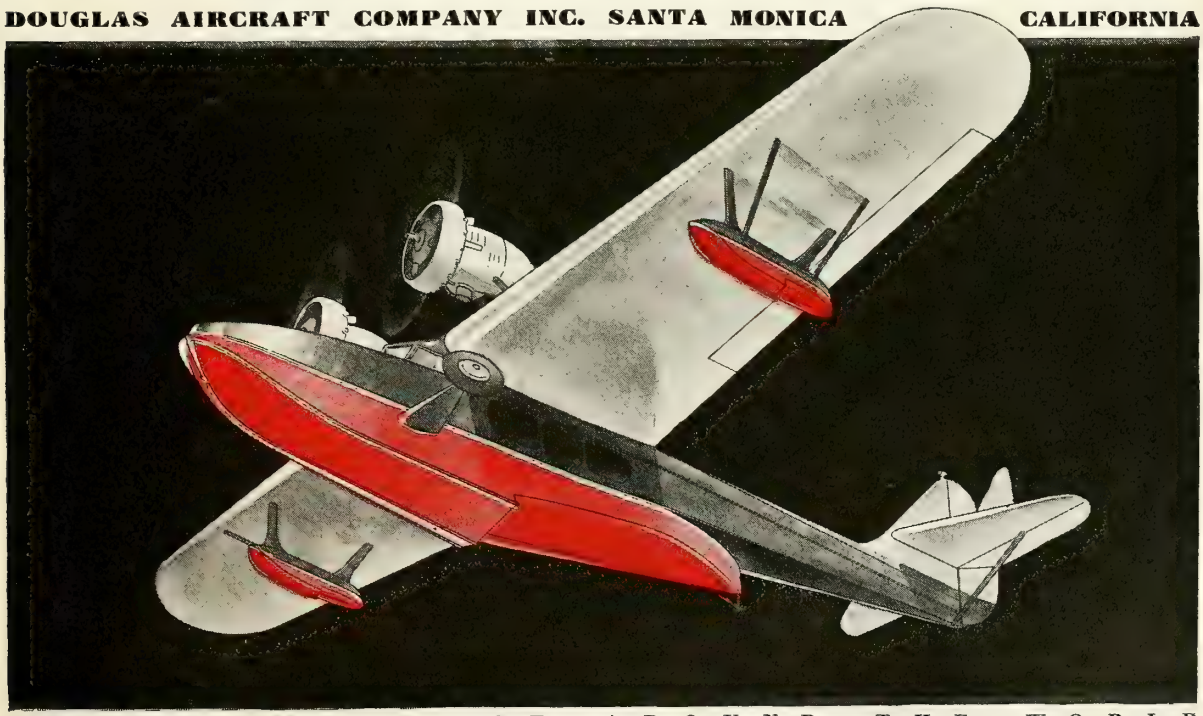


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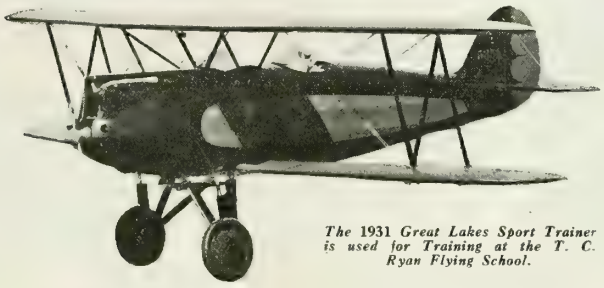
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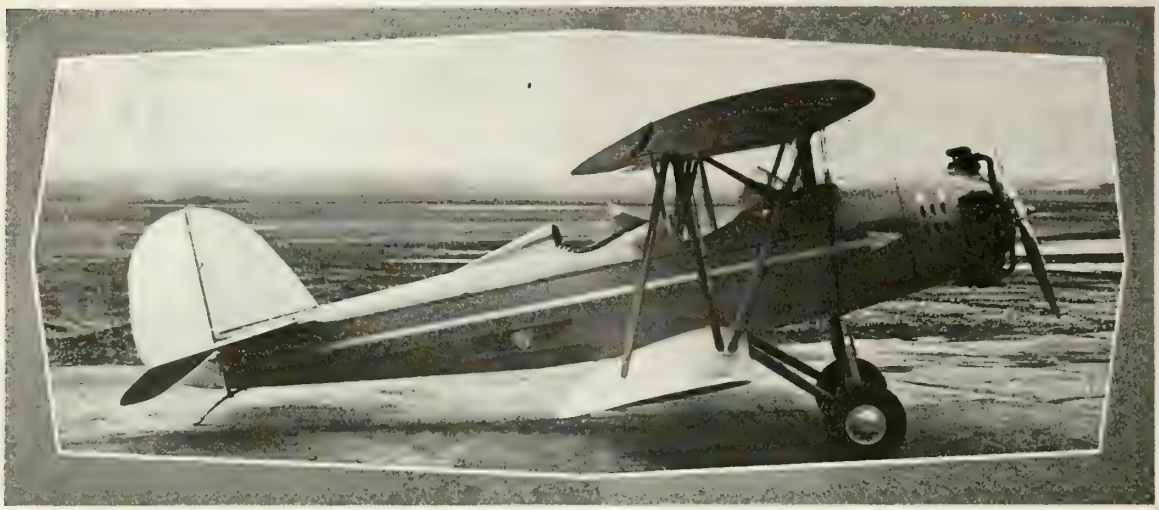
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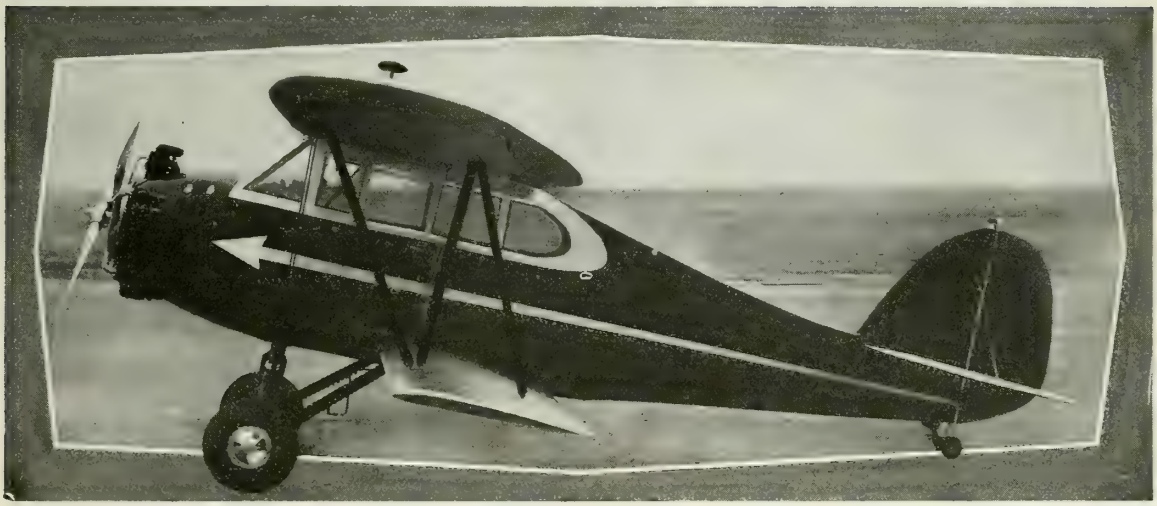
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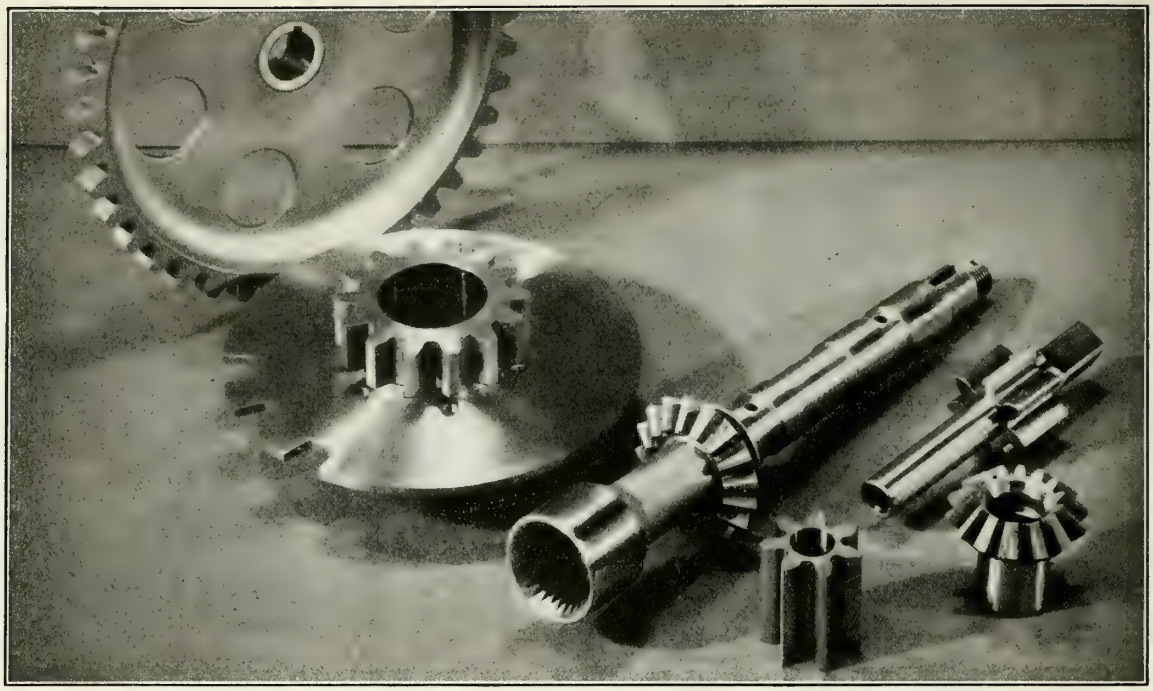
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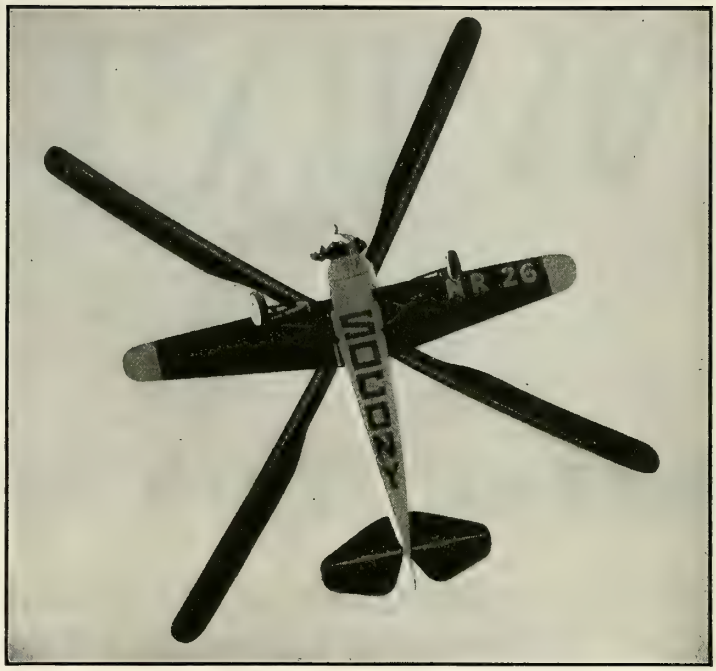
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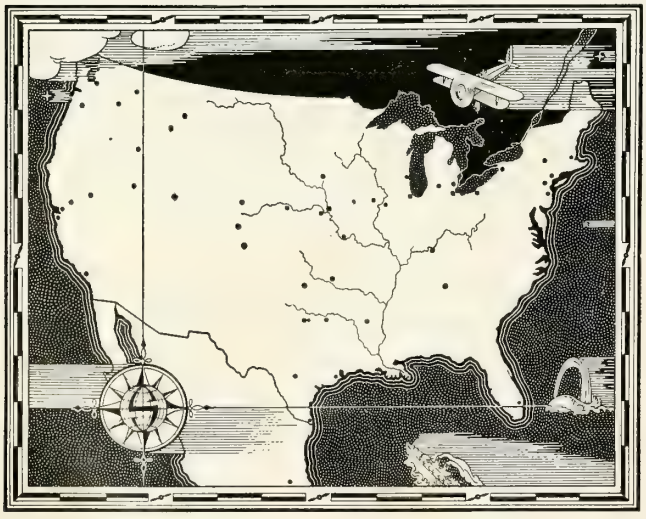
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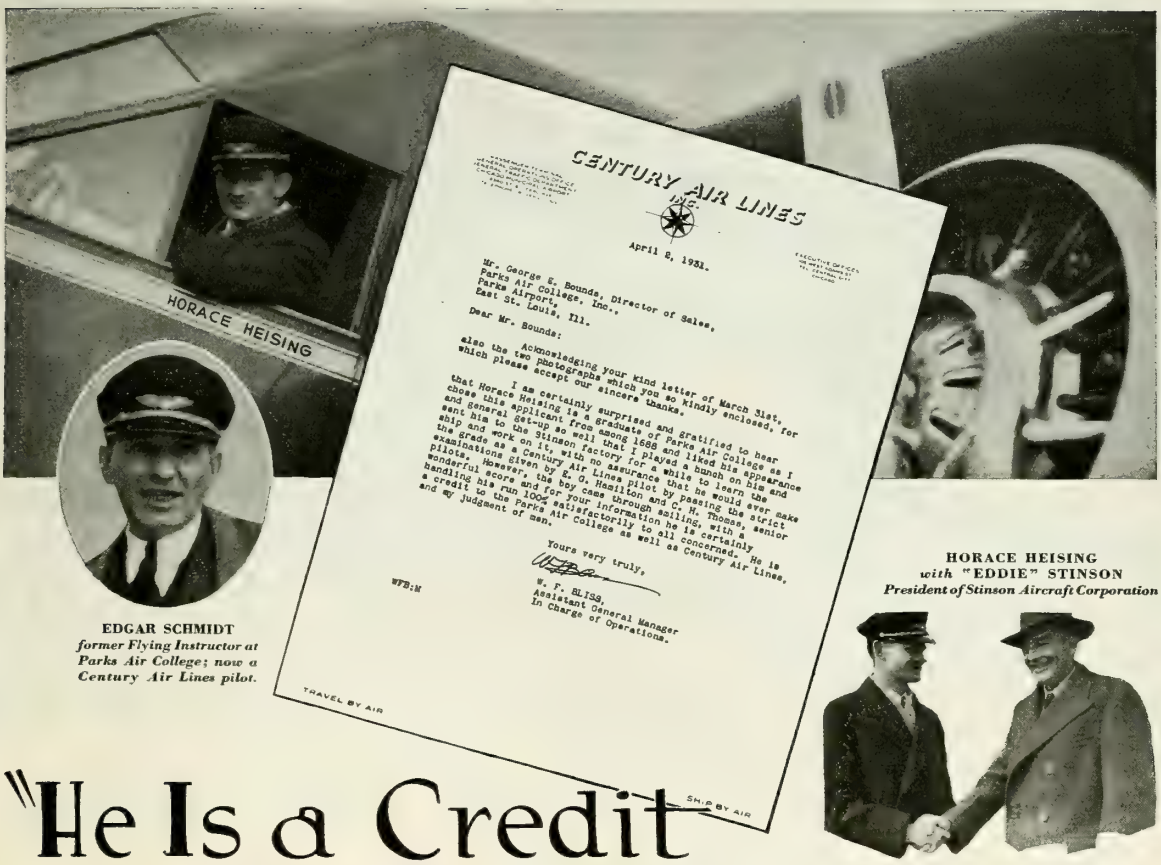
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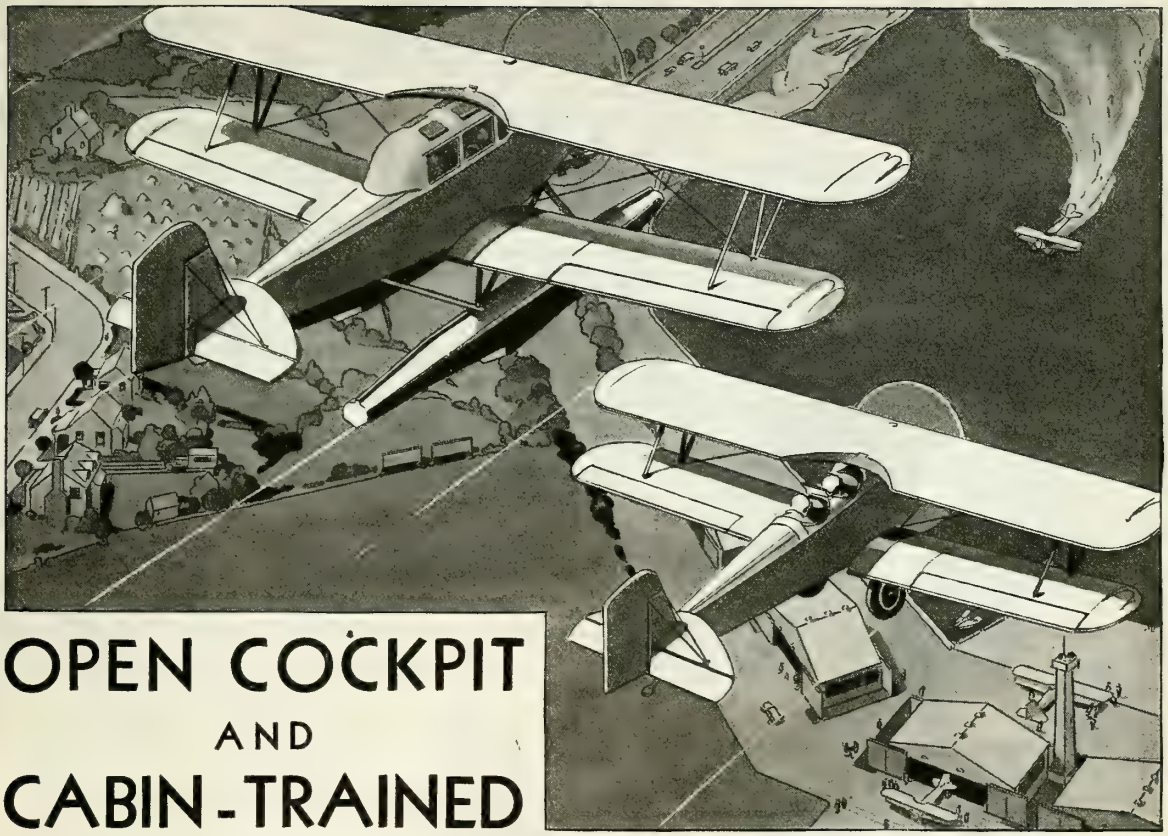
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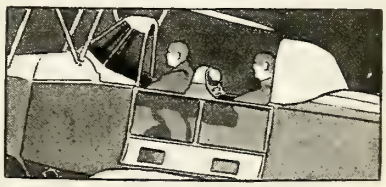


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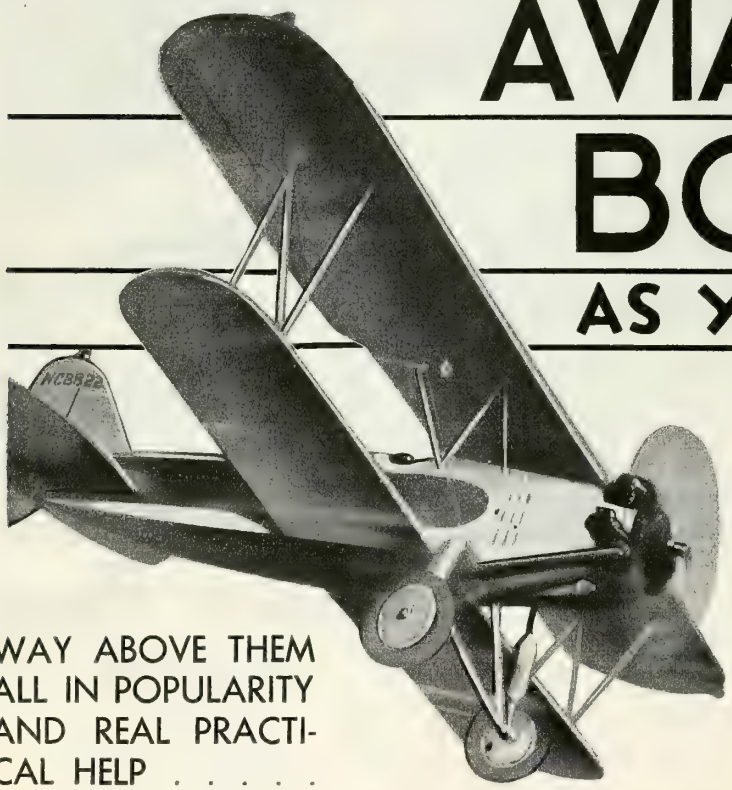
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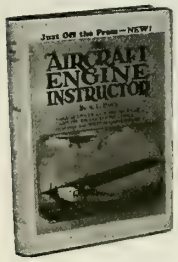
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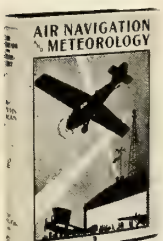
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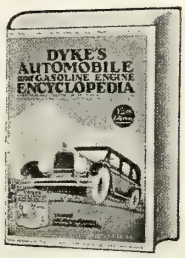
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INCORPORATED

Fairfax Airport Kansas City Kansas

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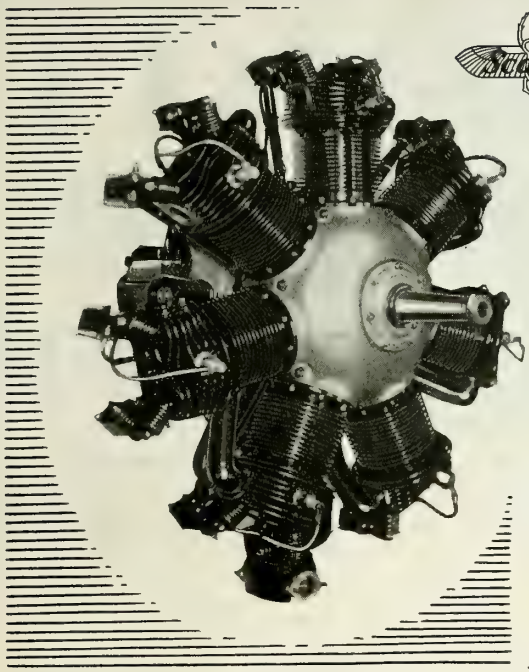
Length	21 ft. 8 in.
Span	36 ft. 0 in.
Height	7 ft. 6 in.

PERFORMANCE WITH 45 H.P. ENGINE

Take-off	7 seconds
Landing speed	25 miles per hour
Climb	700 feet per minute
Cruising speed	85 miles per hour
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Cruising radius	400 miles
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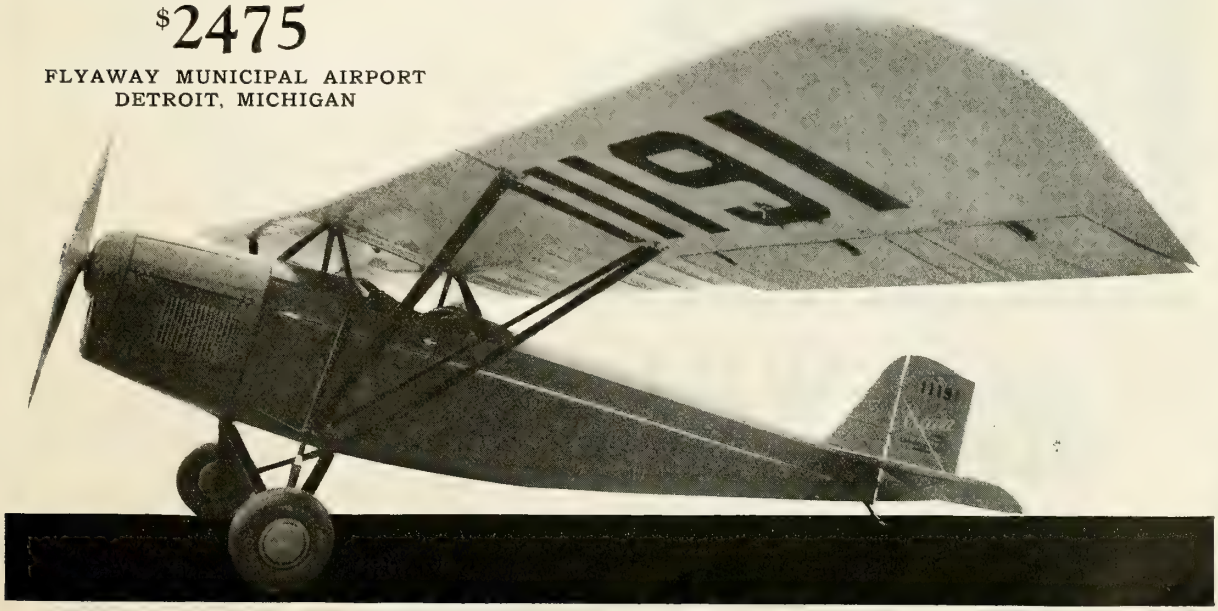
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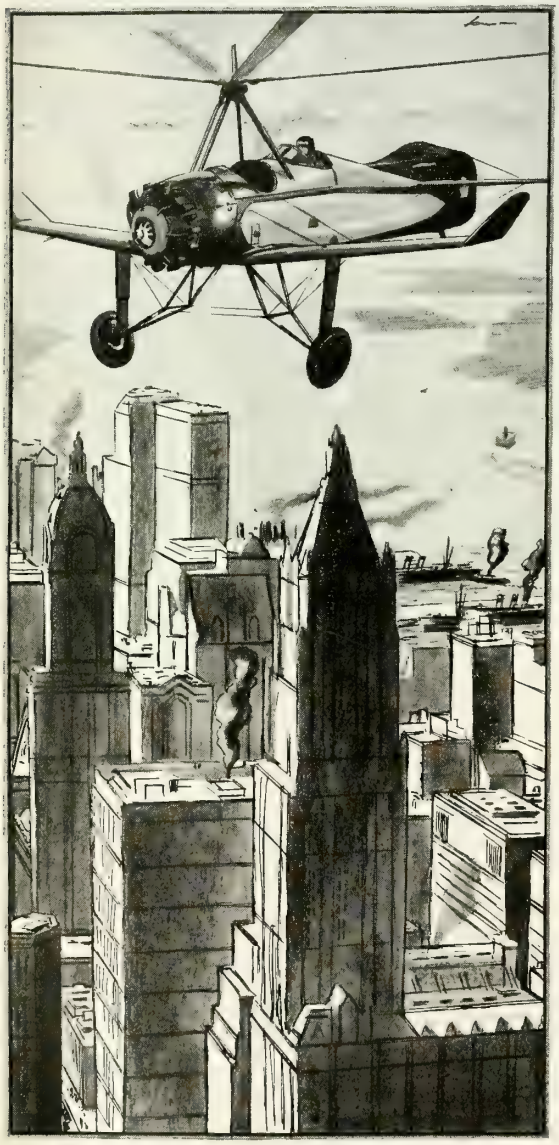
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That's what you get in an engine by Wright. Power enough to win records for speed, yet power so wide in range, so smoothly controlled, that it holds these nimble, gull-like planes to the pace of a passenger liner.

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And manufacturers of the Autogiro selected engines by Wright because they know what "Whirlwinds" can do. For in flights of more than 10,000 miles Autogiros have displayed an alertness undreamed of before ... almost standing still aloft ... to prove that it's easy to fly with Wright!

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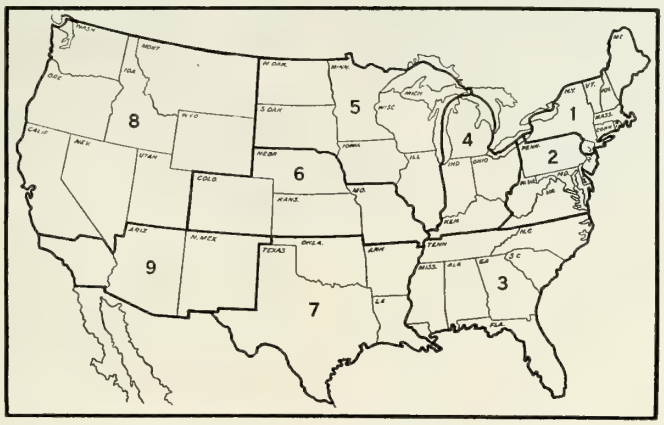
(Acme-P. & A. Photo)

Dropping in on the President—the Autogiro, alighting on the White House lawn, demonstrates a characteristic which won it the Collier Trophy

FEDERAL LICENSING of AIRMEN

LICENSING of airmen is an activity conducted by the Aeronautics Branch of the Department of Commerce for the benefit both of the aeronautics industry and the general public. To the industry, the Department of Commerce airman's license means that the holder is fully qualified to do the work expected of him as a professional airman or to fly safely and competently as an amateur. To the public, these licenses carry the assurance that the airmen who pilot and keep in repair the planes in which it flies, are persons who are capable and experienced.

On March 28, 1931, there were 15,463 pilots and 9,090 mechanics holding active Department of Commerce licenses. This represented a substantial growth over the number at the corresponding time in the previous year, when there were 11,229 licensed pilots and 8,111 licensed mechanics. The Department also licenses parachute riggers, and on March 28 there were 140 active licenses of this grade. There were no licensed parachute riggers a year ago, as the regulations involving this license did not become effective until July 1, 1930.



Map showing Department of Commerce inspection districts

To be eligible for license, each of these airmen had to meet the standards established by the Department of Commerce as to qualifications, training, and experience. These standards, which are embodied in the Air Commerce Regulations, have been made high so that only those applicants who will be able to meet fully their obligations as airmen will be able to fulfill the requirements.

The procedure for obtaining licenses, which is described hereafter for each grade, has been made as simple as possible, but the examinations are necessarily thorough and rigid. The Department of Commerce, realizing the importance of the duties with which it is charged by the air commerce act of 1926, endeavors to aid airmen and aircraft manufacturers as much as possible, but at the same time to fulfill its obligation to the public. The Air Commerce Regulations governing licensing of airmen were drawn up with these purposes in mind, and have been amended when experience showed that revisions were needed.

Licensing of Pilots

Pilots are licensed according to their experience, physical qualifications, and the type of flying that is intended. Each applicant for a pilot's license is carefully examined as to his physical qualifications, his knowledge of flying, and his ability to operate aircraft, and is licensed only if he proves himself fully qualified to hold the type of license applied for.

Licensed pilots are classed as commercial or private pilots. Commercial pilots are licensed as transport, limited commercial, industrial, or glider pilots. Private pilots are designated as private pilots or as student pilots. A person may hold a plurality of licenses; for example, he may be a licensed pilot and in addition hold a mechanic's license or a glider pilot's license.

Privileges of Licensed Pilots

A glider pilot may pilot any type of motorless aircraft, but shall not transport persons or property, nor instruct students except in licensed motorless aircraft. A noncommercial glider pilot's license may be issued for noncommercial flights upon satisfactory accomplishment by the applicant of the prescribed flight tests.

Private pilots not designated as students may pilot licensed aircraft, but can not carry persons or property for hire in either licensed or unlicensed aircraft. They are not permitted to instruct students in the operation of aircraft in flight for hire. Private pilots designated as students may pilot licensed aircraft, including gliders, for the purpose of receiving instruction only, and then must fly within safe gliding distance of the field from which they are receiving instruction.

A pilot who has received an industrial license is entitled to pilot any type of licensed aircraft not carrying persons for hire, but he is prohibited by the regulations from piloting unlicensed aircraft carrying either persons or property for hire, and shall not instruct students in the operation of aircraft in flight for hire.

Limited commercial pilots are entitled to the same privileges conferred upon transport pilots and are subject to the same restrictions, except that they shall not, for hire, instruct students in the operation of aircraft in flight, and shall not pilot aircraft carrying persons for hire outside of the areas mentioned in their licenses. However, they may be permitted to function as co-pilot on dual-controlled aircraft when accompanied by a transport pilot who is in command of and responsible for the operation of such aircraft.

A transport pilot may operate any type of licensed aircraft, but shall not carry persons for hire in licensed aircraft other than of the types and classes specified in his license, and shall not pilot unlicensed aircraft carrying persons or property for hire.

An industrial, limited commercial, or transport pilot must be at least eighteen years of age; a private pilot must be sixteen years of age or over and a glider pilot, at least fourteen years.

Citizenship of Licensed Pilots

A glider or private pilot may be a citizen of any country while an applicant for a license in the industrial, limited

commercial, or transport grades must show that he is either a citizen of the United States, a citizen of a foreign country which grants reciprocal commercial pilot privileges to citizens of the United States on equal terms with citizens of such foreign country, or an alien who has filed his declaration of intention to become a citizen of the United States and advises the Secretary of Commerce of the serial number of such declaration, the date thereof, and the court in which filed. It is necessary that a pilot securing a license under the latter provision diligently and successfully prosecute the naturalization proceedings under penalty of the revocation of his pilot's license, and he must keep the Department of Commerce advised, from time to time, of the status of such proceedings. All applicants for pilots' licenses above the grade of private pilot shall be able to read, write, speak, and understand the English language except applicants who are citizens of a country with which the United States has reciprocity with respect to standards for and privileges of commercial pilots.

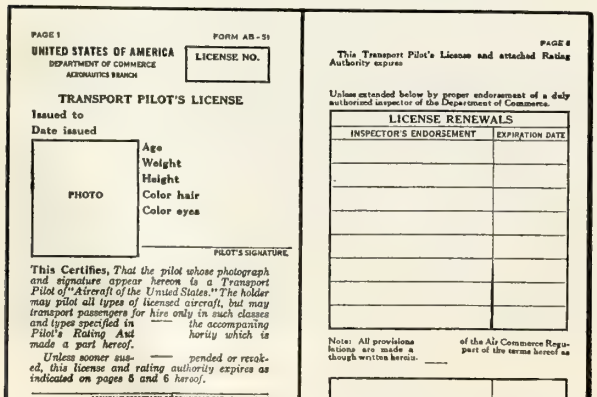
Procedure For Obtaining License

The first step in obtaining a pilot's license or a student permit from the Department of Commerce consists of being examined physically. A student pilot, before he may receive instruction in a licensed aircraft from a licensed instructor, must submit an application for a student pilot's permit and then pass the physical examination.

The student permit then may be issued by the authorized medical examiner of the Department of Commerce who conducts the examination, if the examination shows that he is physically qualified. Other classes of pilots must present to an aeronautical inspector in the district in which they reside the certificate of physical examination, together with an application filled out under oath.

All application blanks may be obtained from the supervising aeronautical inspector for the district in which the applicant resides or from an aeronautical inspector. (See accompanying map of inspection districts, and list of districts with their addresses at the end of this article.)

The physical examinations for pilot's licenses are conducted by physicians designated as authorized medical examiners of the Department of Commerce. There are approximately 788 physicians so designated who are located throughout the country so that the applicant may, in most instances, take the examination in his own locality. The district supervising inspector will be able to give the name



PAGE 1 FORM AR-51

UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE
AERONAUTICS BRANCH

LICENSE NO.

TRANSPORT PILOT'S LICENSE

Issued to

Date issued

PHOTO

Age
Weight
Height
Color hair
Color eyes

PILOT'S SIGNATURE

This Certifies, That the pilot whose photograph and signature appear hereon is a Transport Pilot of "Aircraft of the United States." The holder may pilot all types of licensed aircraft, but may transport passengers for hire only in such classes and types specified in ___ the accompanying Pilot's Rating And hority which is made a part hereof.

Unless sooner sus- ___ pended or revoked, this license and rating authority expires as indicated on pages 5 and 6 hereof.

ASSISTANT SECRETARY OF COMMERCE FOR AERONAUTICS

PAGE 6

This Transport Pilot's License and attached Rating Authority expires

Unless extended below by proper endorsement of a duly authorized inspector of the Department of Commerce.

LICENSE RENEWALS

INSPECTOR'S ENDORSEMENT	EXPIRATION DATE

Note: All provisions of the Air Commerce Regulations are made a part of the terms hereof as though written herein. ___

Pages 1 and 6 of transport pilot's license

Form AR-111

DEPARTMENT OF COMMERCE
AERONAUTICS BRANCH

APPLICATION FOR STUDENT PILOT'S PERMIT

(To be completed by applicant)

Name (print or type) _____ (Last name) _____ (First name) _____ (Initial)

Address _____

Place of birth _____ Date of birth _____, 19____

1 Sex _____ Height _____ Weight _____ Eyes _____ Hair _____

Citizenship _____

I hereby certify that the above information is correct.

_____
(Signature of applicant)

(To be completed by authorized medical examiner)

2 Was Student Permit issued? _____ Date _____, 19____

_____
Authorized Medical Examiner.

(To be completed by Department of Commerce)

3 Approved for (Private) (Transport)

_____
Medical Director.

Application form for student pilot's permit

and address of the medical examiner, to whom an applicant may apply, or this information may be obtained from Aeronautics Bulletin No. 23, Medical Examiners of the Aeronautics Branch.

Physical Standards

All the physical examinations are based on what are recognized as the minimum physical standards of flying and are designed to detect those defects which would present an element of danger if the applicant were allowed to fly. The examination covers the acuteness of vision; the ability to judge distance; the ability to coördinate action of the eyes; color vision; the size of the visual field (ability to see out of the side of the eyes when looking straight ahead); and an examination for eye disease. In the passenger-carrying grades of licenses—limited commercial and transport—the coördination of the eyes and the size of the visual fields are examined more closely and the ability to change the focus of the eyes from far to near is tested. The ear, nose, and throat are examined for disease and obstructions, and the power to maintain one's equilibrium is tested. Then a general physical examination is given, particular attention being paid to the heart, lungs, and kidneys. Finally, there is an examination of the nervous system to detect the presence of organic disease and moderate or severe functional disease.

The standards of medical examinations vary with the class of flying the applicant desires to engage in. They are highest for the transport and limited commercial pilots, as these may carry passengers; next highest for the industrial license; and lowest for the private pilot and student. The student pilot may take the physical examination for any class of pilot that he chooses, but he must take at least the private grade of examination before he will be allowed to receive instruction in a licensed plane from a licensed instructor.

After the pilot has received his license he must have his physical condition checked at intervals. A re-examination is required before each renewal of license—in the transport and limited commercial pilots' grades every six months, and in the other grades once a year.

Fees For Medical Examinations

The fees for the examinations which are received by the examining physicians have been set as standard by the Department of Commerce and are as follows: For the

original examination for transport, limited commercial, and industrial pilots, $15; original examination for private and student pilots, $10; annual re-examination for any grade, $10; mid-year check of transport and limited commercial pilots, $5. All physical examination reports are sent to the medical section of the Aeronautics Branch in Washington, where final decision is made as to qualification or disqualification.

A candidate for pilot's license or renewal may be exempt from the physical examination upon filing with the Secretary of Commerce a certified copy of the examination for flying in the United States Army, Navy, or Marine Corps made within six months of the date of filing his application for a pilot's license or renewal, provided his physical qualifications as shown by such copy of the examinations are not less than those required by the Air Commerce Regulations for the class of license for which he applies. Pilots licensed in a lower grade of license, who apply for a higher grade, must submit a new satisfactory physical examination for the grade applied for unless the previous examination submitted was for the higher grade, and is of recent enough date to warrant exemption.

A student pilot is eligible for his student permit when he passes his physical examination. Having received this permit, he is privileged to pilot licensed aircraft, including gliders, when receiving flying instruction, but not to pilot licensed or unlicensed aircraft carrying persons or property for hire, and he shall not pilot licensed aircraft for any other purpose than receiving flying instructions nor within any other area than in the immediate vicinity of the airport or landing field upon which instruction is based and within safe gliding distance thereof.

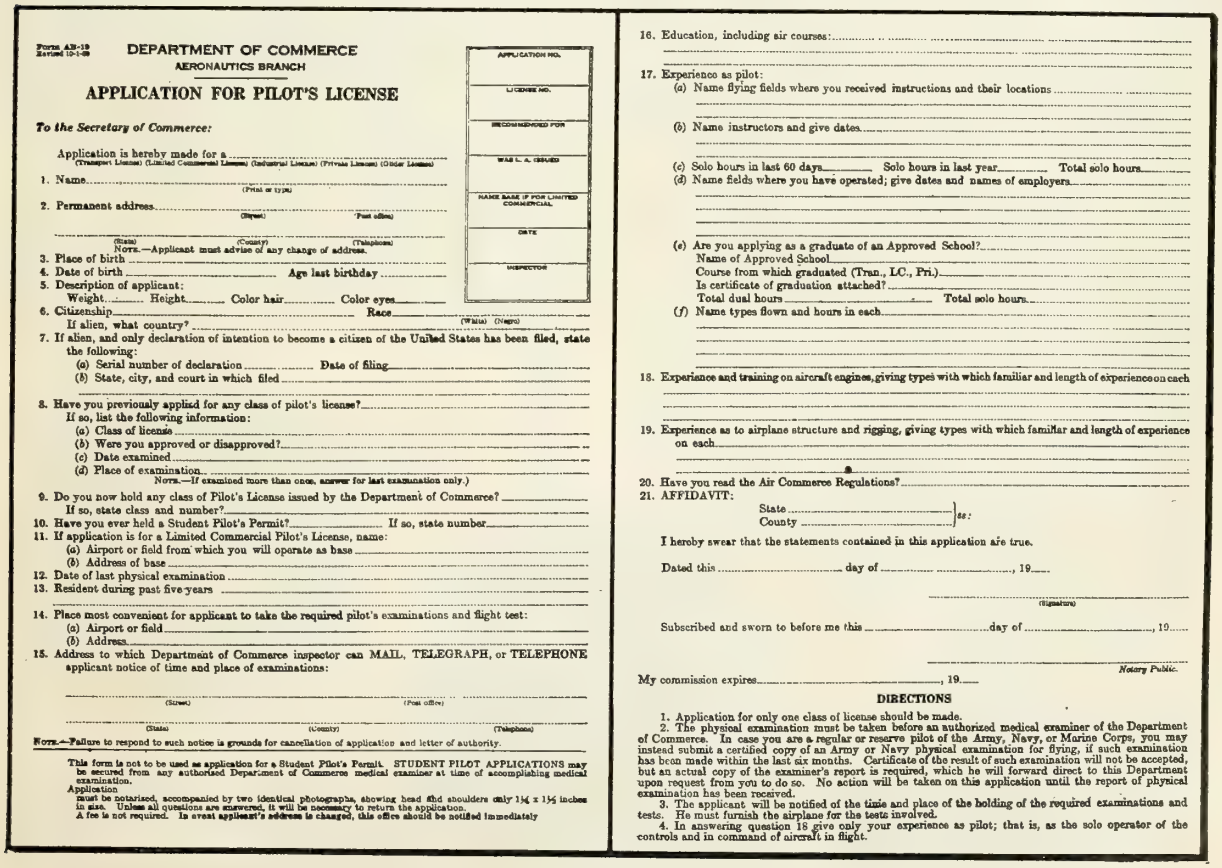
Application For License

When the applicant has received sufficient ground and flying instruction to meet the requirements of the grade of license desired, he is prepared for the next step toward securing a pilot's license, which is to apply to the district supervisor for the type of license desired and arrange for an appointment for his written examination and flying tests. Aeronautical inspectors travel throughout each of the districts making inspections and conducting examinations at various airports, and applicants are advised of the dates when inspectors will be in their localities.

If the applicant is applying for a private pilot's license he must have had ten hours of solo flying, of which at least two hours must have been made within the last preceding 60 days prior to the filing of the application. An applicant who is a graduate of an approved civilian flying school giving instruction in flying may credit a portion of his dual and check time toward the solo-flying experience required, provided he applies for a license within ten days of graduation.

For an industrial license the applicant must have had 50 hours of solo flying, of which at least five hours must have been made within the last preceding 60 days prior to the filing of the application.

Applicants for limited commercial pilot's license must



Form AN-12
Revised 12-1-30

DEPARTMENT OF COMMERCE
AERONAUTICS BRANCH

APPLICATION FOR PILOT'S LICENSE

To the Secretary of Commerce:

Application is hereby made for a ..... license.
(Transport License) (Limited Commercial License) (Industrial License) (Private License) (Other License)

1. Name .....
(Print or type)
2. Permanent address .....
(Street) (Post office)
(State) (County) (Telephone)
NOTE.—Applicant must advise of any change of address.
3. Place of birth .....
4. Date of birth ..... Age last birthday .....
5. Description of applicant:
Weight ..... Height ..... Color hair ..... Color eyes .....
6. Citizenship ..... Race .....
(White) (Negro)
If alien, what country? .....
7. If alien, and only declaration of intention to become a citizen of the United States has been filed, state the following:
(a) Serial number of declaration ..... Date of filing .....
(b) State, city, and court in which filed .....
8. Have you previously applied for any class of pilot's license? .....
If so, list the following information:
(a) Class of license .....
(b) Were you approved or disapproved? .....
(c) Date examined .....
(d) Place of examination .....
NOTE.—If examined more than once, answer for last examination only.)
9. Do you now hold any class of Pilot's License issued by the Department of Commerce? .....
If so, state class and number? .....
10. Have you ever held a Student Pilot's Permit? ..... If so, state number .....
11. If application is for a Limited Commercial Pilot's License, name:
(a) Airport or field from which you will operate as base .....
(b) Address of base .....
12. Date of last physical examination .....
13. Resident during past five years .....
14. Place most convenient for applicant to take the required pilot's examinations and flight test:
(a) Airport or field .....
(b) Address .....
15. Address to which Department of Commerce inspector can MAIL, TELEGRAPH, or TELEPHONE applicant notice of time and place of examinations:
(Street) (Post office)
(State) (County) (Telephone)
NOTE.—Failure to respond to such notice is grounds for cancellation of application and letter of authority.

This form is not to be used as application for a Student Pilot's Permit. STUDENT PILOT APPLICATIONS may be secured from any authorized Department of Commerce medical examiner at time of accomplishing medical examination.
Application must be notarized, accompanied by two identical photographs, showing head and shoulders only 1½ x 1½ inches in size. Unless all questions are answered, it will be necessary to return the application.
A fee is not required. In event applicant's address is changed, this office should be notified immediately

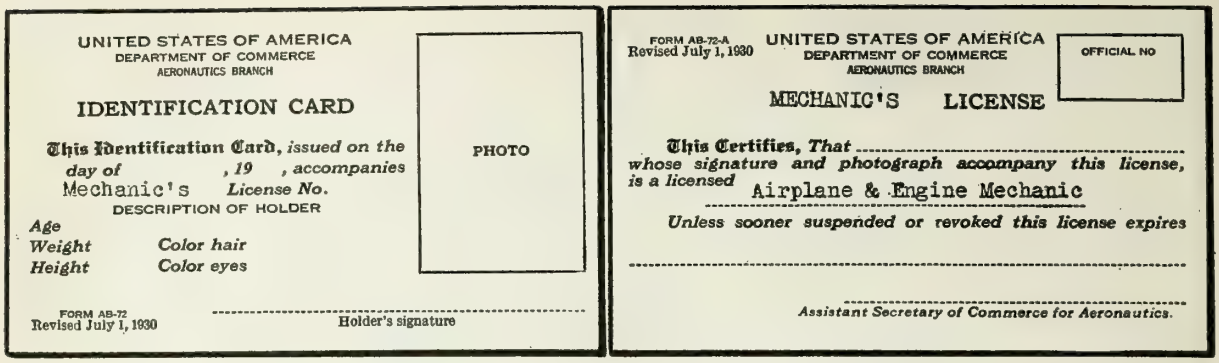
APPLICATION NO.
LICENSE NO.
RECOMMENDED FOR
WAS L. A. ISSUED
NAME BASE (IF FOR LIMITED COMMERCIAL
DATE
INSPECTOR

16. Education, including air courses: .....
17. Experience as pilot:
(a) Name flying fields where you received instructions and their locations .....
(b) Name instructors and give dates .....
(c) Solo hours in last 60 days ..... Solo hours in last year ..... Total solo hours .....
(d) Name fields where you have operated; give dates and names of employers .....
(e) Are you applying as a graduate of an Approved School? .....
Name of Approved School .....
Course from which graduated (Tran., LC., Pri.) .....
Is certificate of graduation attached? .....
Total dual hours ..... Total solo hours .....
(f) Name types flown and hours in each .....
18. Experience and training on aircraft engines, giving types with which familiar and length of experience on each .....
19. Experience as to airplane structure and rigging, giving types with which familiar and length of experience on each .....
20. Have you read the Air Commerce Regulations? .....
21. AFFIDAVIT:
State .....
County ..... } ss:
I hereby swear that the statements contained in this application are true.
Dated this ..... day of ....., 19....
(Signature)
Subscribed and sworn to before me this ..... day of ....., 19....
Notary Public.
My commission expires ....., 19....

DIRECTIONS

1. Application for only one class of license should be made.
2. The physical examination must be taken before an authorized medical examiner of the Department of Commerce. In case you are a regular or reserve pilot of the Army, Navy, or Marine Corps, you may instead submit a certified copy of an Army or Navy physical examination for flying, if such examination has been made within the last six months. Certificate of the result of such examination will not be accepted, but an actual copy of the examiner's report is required, which he will forward direct to this Department upon request from you to do so. No action will be taken on this application until the report of physical examination has been received.
3. The applicant will be notified of the time and place of the holding of the required examinations and tests. He must furnish the airplane for the tests involved.
4. In answering question 18 give only your experience as pilot; that is, as the solo operator of the controls and in command of aircraft in flight.

Facsimile showing both sides of the application form for pilot's license



UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE
AERONAUTICS BRANCH

IDENTIFICATION CARD

PHOTO

This Identification Card, issued on the day of , 19 , accompanies Mechanic's License No.

DESCRIPTION OF HOLDER

Age
Weight Color hair
Height Color eyes

FORM AB-72
Revised July 1, 1930

Holder's signature

FORM AB-72-A
Revised July 1, 1930

UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE
AERONAUTICS BRANCH

OFFICIAL NO

MECHANIC'S LICENSE

This Certifies, That .....
whose signature and photograph accompany this license, is a licensed Airplane & Engine Mechanic

Unless sooner suspended or revoked this license expires

Assistant Secretary of Commerce for Aeronautics.

Blank used for airplane mechanic's, engine mechanic's and parachute rigger's licenses

have had the same solo-flying experience as required for industrial pilots.

Transport pilot's license applicants must have had 200 hours of solo flying, of which at least five hours must have been made within the last preceding 60 days prior to filing the application.

There is no minimum flying experience required for glider pilot's license applicants.

Examinations and Flight Tests

When the applicant has given satisfactory evidence to the aeronautical inspector that he has had the flying experience requisite for the grade desired, the inspector examines him on the theoretical subjects and then conducts the flight tests. The examinations and flight tests vary according to the type of license applied for.

An applicant for a glider pilot's license, in addition to normal take-offs and landings, must make a series of gentle and moderate banks, together with precision landings, and 360-degree turns, as required.

For a private pilot's license the applicant is examined on the Air Commerce Regulations, including the Air Traffic Rules. In the practical flight test he must make three satisfactory landings to a full stop; a series of three gentle and three moderately steep figure-eight turns; spiral in one direction from 2,000 feet with engine throttled, landing in normal landing attitude by wheels touching the ground in front of and within 500 feet designated by the examiner. A private pilot classed as a student will be licensed without being required to pass these examinations and tests.

An applicant for an industrial pilot's license is examined on the Air Commerce Regulations, including the Air Traffic Rules, and is given a theoretical examination in elementary engine and plane mechanics and rigging. He will also be required to make the practical flight tests prescribed for transport pilots, except the cross-country flight.

Limited commercial pilot's license applicants will be given the examinations and tests for transport pilots, as set forth in the next paragraph, except the cross-country flight and the examinations in elementary meterorology and navigation.

The applicant for a transport pilot's license must pass an examination on the Air Commerce Regulations, including the Air Traffic Rules, and must also pass a practical and theoretical examination in elementary engine and plane mechanics and rigging and a theoretical examination in the fundamentals of meteorology and air navigation. The practical flight tests will consist of, in addition to normal take-offs and landings, the following maneuvers:

From 1,500 feet, with engine throttled, a 360-degree turn, followed by a landing in normal landing attitude, with wheels touching ground in front of and within 200 feet of a line designated by the examiner; from 1,000 feet, with engine throttled, a 180-degree turn, followed by a landing in normal landing attitude, with wheels touching ground in front of and within 200 feet of a line designated by the examiner; a series of three gentle and three steep figure-8 turns, and 720-degree steep power turns in both directions. A spiral in one direction from 2,000 feet, with engine throttled, and landing in normal landing attitude with wheels touching ground in front of and with 200 feet of a line designated by the examiner; emergency maneuvers, such as spins, spirals, side slips, climbing turns, and recovery from stalls, and such others as may be deemed necessary; and a flight over a triangular or rectangular course at least 100 miles in length, ended by a landing at the place of take-off within five hours from the beginning of the flight. This flight shall include two obligatory landings, not at point of departure, when craft must come to rest. Upon the presentation of satisfactory proof that the candidate has made solo cross-country flights over distances of at least 100 miles within one year preceding the date of his application this flight will be omitted. In addition the applicant will be required to make cross-wind landings and take-offs.

Re-examinations and Renewals

The minimum passing grade for any subject in the theoretical examination is seventy per cent and practical tests must be accomplished to the satisfaction of the examiner. Applicants for pilots' licenses who fail to pass the prescribed theoretical or practical tests may apply for re-examination at any time after the expiration of ninety days from the date of such failure, except applicants for private pilot's license and glider pilot's license who may re-apply after forty-five days. Applicants for pilots' ratings who have failed to pass the prescribed tests for such ratings may re-apply after the expiration of thirty days. If the physical examination has expired for the class of license for which application has been made, a new physical examination must be submitted.

The applications and the inspector's report are sent to the Aeronautics Branch where they, together with related correspondence, are distributed to the proper licensing groups by the files groups in the registration section. Within each group the applica- (*Continued on page* 144)

INSTRUMENT FLYING

By Howard Stark

INSTRUMENT flying I define as flying by the guidance of instruments through conditions of no visibility. This also is usually called blind flying, a handy term, but misleading.

A pilot flying a course through the air by the aid of instruments is no blinder than the navigating officer of an ocean liner guiding his ship over a foggy sea. Yet although we speak of air pilots flying blind, we never think of sea captains navigating blind. Nor are they. Both are guiding their crafts by consulting instruments. The air pilot merely has more instruments to consult to enable him to keep his craft level and going straight in the air.

The first essential for successful instrument flying under conditions of no visibility is good judgment. Although any weather such as thunderstorms, wind, rain, fog, clouds, and snow, (except when ice conditions prevail) can be flown, it would be foolish to fly at such times unless the pilot is trained and unless the instrument board is equipped for that sort of flying. With practice, instrument flying is not difficult; it may be learned by any pilot who will take the time to practice it.

An experienced mail pilot can leave in bad weather and fly through bad weather with safety if he knows that the weather is good at his destination. He can also go into bad weather at his destination if he can keep in sight of the ground. But he cannot land blind. In short, he should have fair weather somewhere and not go too far away from it, for gas lasts only a limited time. The story, "He took off in a fog, flew 400 miles in a fog, and landed in a fog," is still a good story.

A passenger-plane pilot should know instrument flying, even though he has no intention of taking his passengers through a condition of no visibility—a condition, however, in which he may occasionally find himself. A knowledge of instrument flying would help him in haze, rough air and night flying. If he happened to go too far in bad weather, it also would enable him to turn at a safe altitude instead of scraping around just above the trees—possibly hitting the ground in his turn as occurred at Oceanside last winter.

Many pilots can and do fly blind for hours, with the ship sailing along serenely. This may give them confidence that they really are competent blind fliers, which they may not be. Some night they may get into a spin and not be able to get out of it. A spin is the real test for blind fliers. If they're not really blind fliers, the chances are that they will bail out, under the impression that there is something wrong with the ship, when often the only thing wrong is that they don't know how to get it out of a spin.

Ask the average blind flying pilot how to do it and he will tell you, "Keep all of the instruments centered." But if you are a beginner and try to do that yourself in turbulent air, you will very probably find that it can't be done. You may even find yourself coming out in a tailspin, providing there is ceiling when you come out. At first you will find it utterly impossible to look at all of the instruments at once and keep them all centered. Yet if you do not keep them all centered, you will not be flying a straight path of flight.

For the purpose of keeping the airplane level and flying straight at a constant altitude, you should have three instruments, the bank and turn indicator, the rate of climb indicator, and the ball bank indicator. Let us suppose a condition where your plane, equipped with these three instruments, is out of control and apparently in a spin. All three instruments are off center: the turn indicator pointing to the left, the rate of climb indicator pointing downward, and the ball of the bank indicator off to the right.

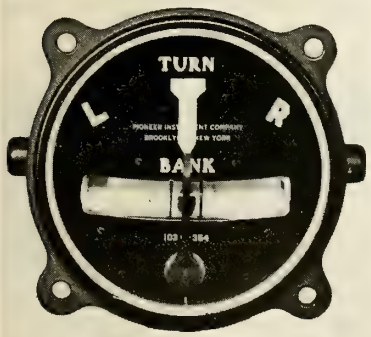
Now if you follow the usual advice, "Get all of the instruments centered," you will certainly have your hands full, and although you may change the positions of any one or all of the three instruments, you may continue in that spin or come out of it and go into another.

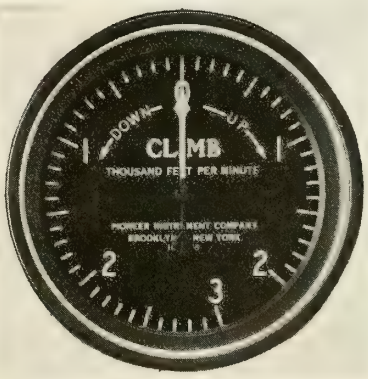
The thing to do in this contingency is to forget momentarily that you have any instruments other than the turn indicator, and center your attention on that to bring the pointer to center. Since the turn indicator is the most sensitive and quickest acting of the three, it will come to the center almost as soon as you push your rudder in the desired direction. That is, if your pointer is to the left, push right rudder until the pointer is centered.

You now have your plane going in a straight line in some unknown direction. For the purpose of centering the other two instruments, it is immaterial in which direction the plane may be headed for the moment, so long as the turn indicator is at center.

Now look at the climb indicator to see if the plane is going up or down. If you have lost altitude, as you prob-

(*Continued on page* 140)





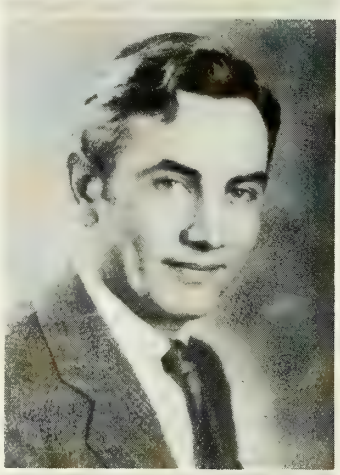


Except when the pilot has an artificial horizon, he needs three instruments — turn indicator, climb indicator, and ball bank indicator — to fly in conditions of no visibility. To bring his ship back to normal flight position, he should center the instruments one at a time in the order shown here, left to right

A DESIGNER'S IMPRESSIONS OF THE DETROIT AIR SHOW

By Dwight Huntington

MANY improvements over last year's exhibition, particularly in regard to detail design, were noted at the recent Detroit Show. A depressing part of the exhibition, however, was observed in the amount of direct copying of contemporary work—of complete designs, without apparent effort toward betterment—by designers who plainly had suffered from lack of creative ability, with a resulting imitative complex. Evidently several designers and manufacturers chose to ignore the eighth law of Moses. Certainly there is no surer way for a design department to lower itself professionally and, at the same time, openly admit its incompetence, than by reproducing the design of another manufacturer and entering into competition with him. Incidentally, only one of the several copy-models exhibited was an improvement over the original. The others were plainly inferior to their originals, mistakes having been copied with fully as much thoroughness as were the meritorious features. Lacking the background of research and experimentation which constitutes the foundation of truly creative work, the efforts of the copy artist seldom appear worthwhile. Much more frequently do they prove a liability to the manufacturer.

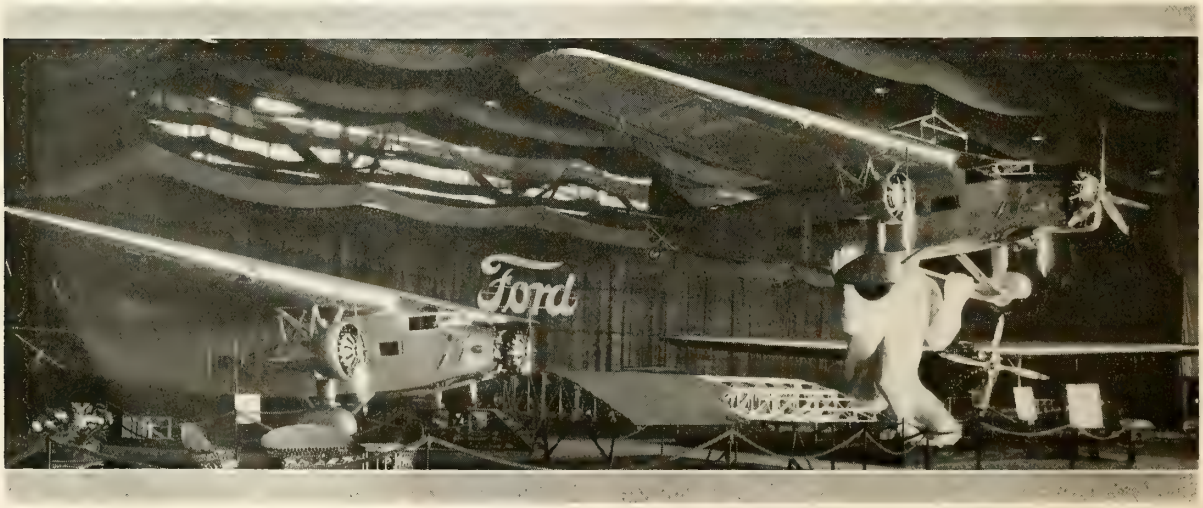


In refreshing contrast with the works of the imitators stood the highly original designs of G. M. Bellanca. Not only are his ships second to none in excellency of manufacture, in performance and operating efficiency, but each model is indelibly stamped with an individuality that defies imitation. Mr. Bellanca's trail-blazing courage is a splendid example to all designers.

From the novelty viewpoint the most interesting exhibit undoubtedly was the Autogiro display by the Pitcairn Company. Several two-passenger models, of the tandem open cockpit type, differing principally in powerplants, occupied the floor and others were employed in demonstrations on the field. Although the maximum speeds thus far attainable with the Autogiros do not appeal to many pilots, their simplicity of operation and unapproached speed ranges certainly will have an ever-increasing appeal to tens of thousands of laymen who, after all, are the ones the industry must cater to for expansion. Just what an Autogiro of transport proportions, or say of four-passenger coach size would be like, is an interesting conjecture. Probably one beneficial influence of the Autogiro on plane design will soon be noted in lower stalling speeds, which improvement is of much greater importance to pleasure fliers than increase in top speeds.

The outstanding trend in plane design lay in the direction of new pleasure type craft of from two to four passenger capacities. There was a noticeable decrease in the number of ships in the flying stock category on exhibition.

Two trimotors were shown by Ford as well as a new cargo carrier, powered with a single Hispano-Suiza water-cooled unit of 650 horsepower. The performance of this ship, carrying a payload of 3,400 pounds, compares favorably with that of the 900 horsepower trimotor, the high speed being around 130 miles per hour. Trimotor reliability, however, is of course sacrificed. Probably the next step in transport design will be the substitution of larger, liquid-cooled engines for aircooled radials in trimotors, to be followed by the general discarding of out-



board nacelles in favor power units housed within the wings.

The Fokker exhibit included only three small single-engined jobs of the Universal type, the larger models shown last year having been omitted.

Two recent additions to the transport class were the Sikorsky "S-41" amphibion, and the Bellanca "Airbus," both of which had received considerable publicity prior to the show. The S-41 is practically a re-design on a larger scale of the well-known S-38, the two principal changes being in the discarding of the lower wing and the substitution of Hornet B engines in place of Wasps. In the Airbus Bellanca has once more departed from the conventional and apparently refused to compromise aerodynamic or structural efficiency in favor of one another. Both jobs are credits to the trade-marks they carry.

The Stinson thirteen-passenger trimotor occupies a unique position in the transport group, being practically in a class by itself, and too well known to require further comment here.

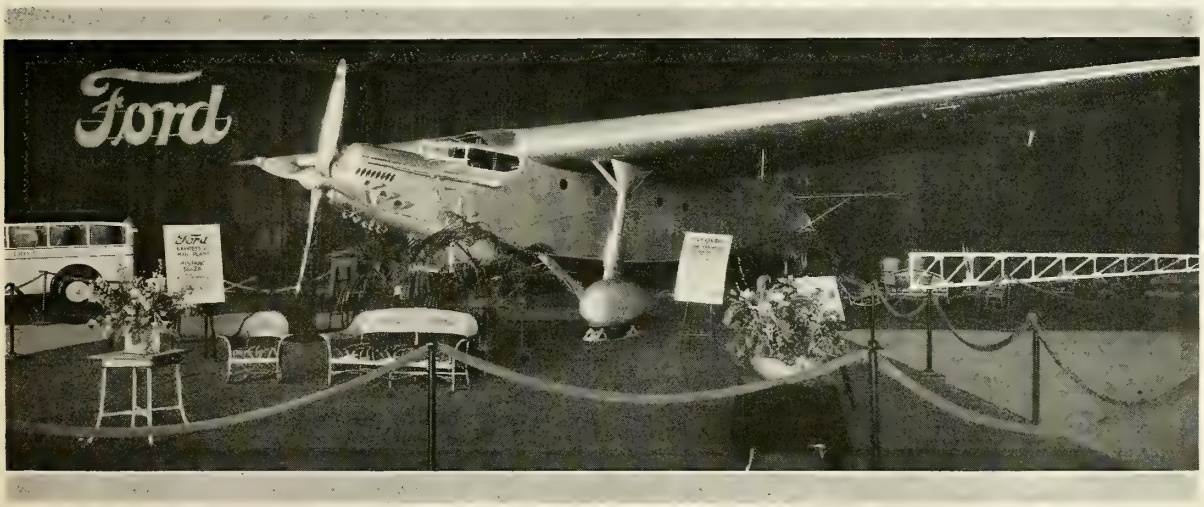
Douglas exhibited a new eight-passenger amphibion, the "Dolphin," powered with two 300-horsepower Wright Whirlwinds. The cantilever monoplane wing is of wood, plywood covered, and mounted on top of the hull, which is of all dural construction. The ship is of imposing proportions and gives the appearance of being very seaworthy as well as airworthy. Cabin and cockpit are very roomy and comfortable. Although the nacelle supports unquestionably are amply strong, the front members appear to be working overtime and may impress one as being of doubtful capacity. Something might also be attempted toward securing some vision rearward from the cockpit, the after hemisphere being totally blind. In all of its major points, however, the craft reveals the splendid design and construction which have made Douglas creations world-famous.

The Towle eight-place amphibion, which made its debut at last year's show, was used this year in demonstration work. Amphibion adaptability; twin Packard Diesel engines for safety, reliability and economy; all metal dura-"bility cantilever construction doing away with rigging; together with the utmost in comfort and convenience, combine to make this a logical ship for airline work. Incidentally, no Packard Diesels were installed in ships on the floor, in contrast with half a dozen models incorporating that powerplant upon its introduction at last year's show. Curiously, too, while this year's exhibition was on, Lees and Brossy piloted their Packard Diesel-engined Bellanca to a new American, non-refueling endurance record.

In the class of fast, single-engined light transports were the Lockheed "Vega" and Consolidated "Fleetster," both well-known highwings; also the Northrop "Alpha" and the Lockheed "Orion" low-deckers enjoying their first showing. All four are seven-place jobs, powered with either P. & W. Wasp or Hornet engines. Both "Vega" and "Fleetster" incorporate aluminum alloy monocoque fuselages and wood wings, and were shown last year. This year's Vega, however, is equipped with a racing type undercarriage which at least has the appearance of being weak. The two axles are the only compression members employed and these are subjected to sizeable initial loads by the numerous streamline wires; to abnormally high bending stresses due to the presence of large and exposed shock units located inboard of the wheels; and finally, to the axial loads in landing, which usually go into shock struts placed at much more advantageous angles. Moreover, the entire thrust of this gear is concentrated at a single point on the fuselage.

A study of this Vega undercarriage impresses upon one the fallacy of our present method of designing wire braced, and strut braced structures, for similar load factors. Eventually the initial loads in the former type must be considered and higher load factors designed for, resulting in a fairer comparison from weight and strength viewpoints.

Northrop's "Alpha," with its heavy, flat, aluminum alloy sheet covering, is an agreeably smooth change from the style of architecture introduced years ago by Professor Junkers. Probably no other ship excells the "Alpha" in symmetry of lines, nor in soundness of construction. Scrutinizing the remarkably smooth contours and the substantial plating here employed, one is inclined to ponder the question whether Northrop may have fallen



for this interplanetary nonsense and become a student of rocketry, with an eye for future business. At any rate, Alpha construction apparently begins where others get tired—so—gangway for Beta!

The Lockheed "Orion" is of all-wood construction along the lines of the well-known "Sirius." The new model incorporates a retractable undercarriage which appears somewhat complicated although a step in the right direction. The top speed of the "Orion" with this gear is estimated at 220 miles per hour as against 180 for the "Sirius."

In the class of six-passenger airsedans were the Bellanca "Skyrocket" and "Pacemaker," Curtiss-Wright "Travel Air" and Detroit-Ryan "Brougham." All are of the high-wing, strut-braced monoplane type with long service records behind them.

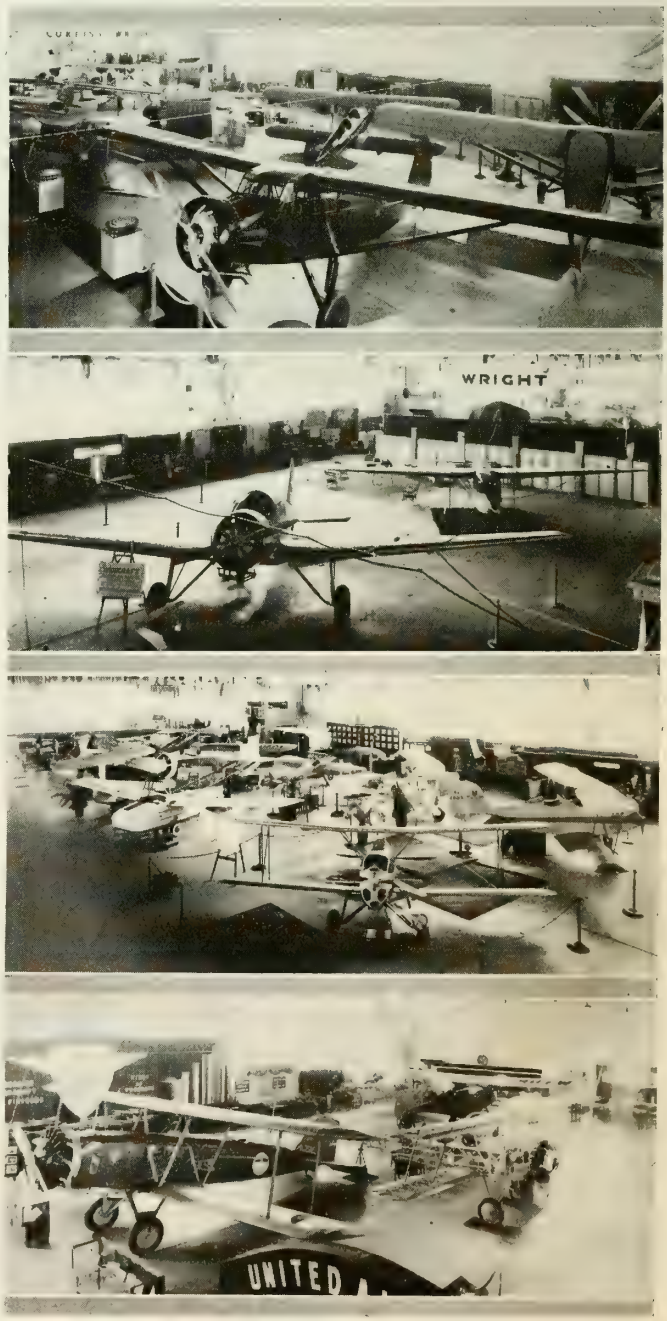
Five-place jobs included the well-known Curtiss-Wright-Keystone-Loening "Commuter" amphibion and an experimental twin Lycoming-engined amphibion by Stinson. This latter ship is of the short hull type with engine nacelles built into the strut-braced monoplane wing. Considering the fact that nacelles and hull must effectively blanket the large center section of the wing, the ship appears undersurfaced At the same time, slight attention seems to have been paid toward weight-saving, many fittings being unnecessarily large, and steel columns employed where aluminum alloy would be far superior. Probably more than 100 pounds may be saved on the wing truss alone by substituting streamline section aluminum alloy struts for the heavy steel members now used, the additional cost running at not over two dollars per pound.

Open four-place jobs included the well-advertised Detroit-Eastman flying boat and the Bird land type biplane. The additional seat installed in the front cockpit of this ship has the appearance of being uncomfortable. A neater arrangement could have been secured by placing the fourth seat alongside the pilot and installing the dual control in the rear cockpit.

Three well-known companies are bidding for this year's coach business: Curtiss-Wright, Stinson and Waco. The first-named offers a redesign of the four-place Travel Air monoplane. It is priced at $4,595 with 180-horsepower Challenger and at $5,100 with the 210-horsepower Kinner, both fully equipped. Stinson's well-known "Junior" with the 210-horsepower Lycoming is priced at $4,995. The Waco Coach, model C, is strictly a 1931 development along Waco biplane lines. Fully equipped, with the Continental 165-horsepower engine, this job is priced at $5,985. The cabin is roomy and comfortable and excellent vision rearward has been secured by a clever and efficient arrangement of the turtle deck. It may safely be said that this ship has better visibility than any other closed job. Model C also appears to have plenty of sail, which should make it very popular, especially in the Rockies. Another four-place enclosed job was the Stout-designed Buckley, a low-wing cantilever monoplane of corrugated aluminum alloy construction. In size this ship compares with the Northrop and Lockheed seven-passenger jobs, thus giving the appearance of being plenty of airplane for the seating capacity.

Open biplanes of the three-place model included the Bird, Stearman, Waco F with Warner 110 and F-2 with Continental 165, Consolidated "Fleet" with Kinner 125, and Curtiss-Wright "Sportsman" with Challenger 180. The American Aeronautical "Savoia" amphibion biplane also was shown, with Kinner 125, and Nicholas-Beazley's NB-4 low wing monoplane with Warner 90—a refinement of the NB-3.

Five two-passenger, side-seating coupe models were exhibited as follows: Monocoupe, (Lambert 90 or Warner 110); Kari Keen, (Warner 90); Swanson, (Warner 110);



Views of the Detroit Air Show. (Photographs by Kalec.)



Views of the Detroit Air Show. (Photographs by Kalec.)

Curtiss-Wright, (Gipsy 90); and Cloud-Coupe, (LeBlond 70). The Swanson job offers something new in wing attachment, increased vision being the objective. The job is especially roomy and comfortable, with large doors and a good-sized luggage compartment that is a relief from the usual afterthought variety. Curtiss-Wright's coupe is a low-wing monoplane of essentially cantilever construction, the single spar wing being reinforced a few feet from the root by a compression strut to the upper longeron. The job is neat in all particulars. A survey of the numerous Curtiss-Wright models, however—monoplanes and biplanes; tractors and pushers; strut-braced, wire-braced and cantilever; high and low wings; and so on *ad infinitum*—impresses upon one that here indeed is a broad-minded design department, with "Every man for himself" as its likely motto.

Stout's "Sky Car" represents an interesting attempt to break away from the conventional. Its newness lies not in any radical design advances but rather in an unusual combination of previously used ideas. The ship is of the two-passenger, tandem seating, enclosed type, principally of aluminum alloy construction, and is powered with the inverted Rover engine of 75 horsepower, driving a pusher screw. The full cantilever wing is mounted on top of the nacelle and is equipped with symmetrical section, balanced wing tip ailerons. Corrugated sheet is used in covering wings, nacelle and tail surfaces, the latter being supported by steel tube outriggers arranged triangularly.

The problem of visibility from the job might be given more attention for although the lower three-quarters of the forward hemisphere leaves nothing to be desired, the ship is blind above and aft. A roof window and rear vision mirrors probably would help considerably. A glance at the materials, workmanship and interior appointments of the "Sky Car" indicates that it is not intended as a competitor in the low-priced class.

Two-place side-seating open cockpit jobs were the Granville Brothers biplane, exhibited last year, and the Paramount, Cain and Nicholas-Beazley monoplanes. The Paramount "Sportster" was the only basically-designed seaplane in the show. It is a wire-braced, low-wing twin float job of pleasing lines, powered with the Warner 110 and priced at $4,985. The Cain is a strut-braced parasol powered with the inverted Cirrus 95. Workmanship is excellent and the ship has many good points. Nicholas-Beazley NB-8 is also of the strut-braced parasol variety, but of rather homely lines. Although originally intended for the 38-horsepower Continental, this design evidently outgrew that engine, resulting in the installation of the Genet 80. A neat folding wing arrangement is an outstanding feature. The price is $1,790.

The two-place tandem open model was represented by the Driggs, with Rover 75, Great Lakes, with Cirrus 90 (and now priced at $2,985), Stearman with Wasp 300, Consolidated with Kinner 125; and Verville, with Continental 165. All are biplanes of excellent, though conventional, design and construction and have been thoroughly proven. Monoplane types included the Fairchild and States, strut-braced parasols equipped with Rover 75 and Kinner 100 respectively; and the Granville Bros. and Northrop low-wings, the former a wire-braced job with Wasp 300 and the latter a beautifully finished, all metal cantilever job with inverted Menasco 95. The well-known Davis was also on the field priced at $2,995 with the Kinner 100. Two high performance single seaters were shown —the Laird "Solution" which solved the Thompson trophy race, although it is dangerously blind, and the Granville Bros. "Sportster." Boeing exhibited a much-used mail plane with an interesting record, which might have been improved by the addition of a list of celebrities that the

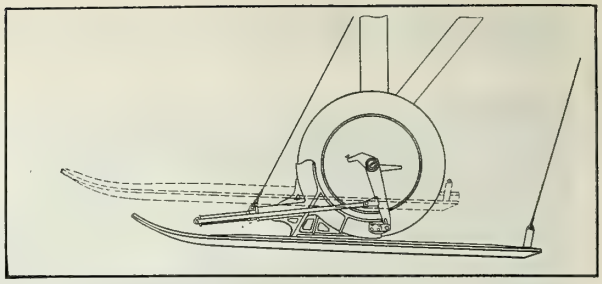
ship has carried safely. Buhl's mail ship of last year was again shown with no apparent changes.

The passing of the glider craze was noted in the absence of this type, with a single exception. The Franklin glider was shown with an interesting outboard motor unit developed from outboard motor parts by the Andrews Laboratories of Chicago. This combination represents the strongest appeal yet made to the beginner to get into the air. The diminutive engine is of the two-cylinder water-cooled type and grinds out ten horsepower at 4,000 revolutions per minute weighs approximately sixty pounds complete and will retail around $150. Complete with powerplant the Franklin will weigh approximately 260 pounds net and the engine appears to be so buttoned on that it can be shoved overboard unceremoniously at the first sign of distemper. Incidentally, the Fraklin is advertised "complete with instrument board less instruments."

Stumbling suddenly upon this Andrews power unit, "Al" Johnson waved his arms excitedly and after making a few incoherent remarks disappeared in the direction of his booth where AERO DIGEST later learned he was feverishly working on the design of a few-candlepower autogiro, with Rusco harness attachment. Perhaps "Al" may also favor us with a smaller model—an umbrella type Autogiro glider, for chuting purposes.

The light plane representation was more quantity than quality. Single seaters included the Heath and Aeronca, both well-advertised, and the Buhl "Bull Pup." The latter ship is of the mid-wing, wire braced type powered with the Szekely 45 and priced at $1,250. The workmanship is excellent and the simply constructed dural monocoque fuselage is an outstanding improvement.

Tandem two-seaters were the American Eagle "Eaglet," Rearwin "Junior," Taylor "Cub" and Curtiss-Wright "Junior"—all strut-braced parasols—the first three, single cockpit jobs utilizing the Szekely, Poyer, and Continental engines respectively. Curtiss-Wright's job — a Szekely powered pusher—includes individual cockpits and like the "Eaglet" carries an A. T. C. The nose section of the fuselage appears understrength and the rear spar center section struts might be beefed up to advantage. The nacelle bracing wires below the wing could be relocated to serve also as guards, to prevent people from walking into the propeller. Probably the rear cockpit would not be so noisy if more thought were given to the exhaust port on the lower right cylinder, which is directed against the blades of the wood propeller. Similarly the bent axle problem



Perry ski-wheel unit by Aircraft Products Corporation

may later on entail some alterations to the built-in undercarriage design.

Most of these ships were lacking in interior finish, fairing strips and structural members being exposed in an unsightly manner. One simple and inexpensive means of circumventing this problem consists in the use of a muslin lining in the cockpits, applied with pigmented dope.

The new side-seating two-passenger Aeronca reveals neat workmanship and performs suprisingly well for its power.

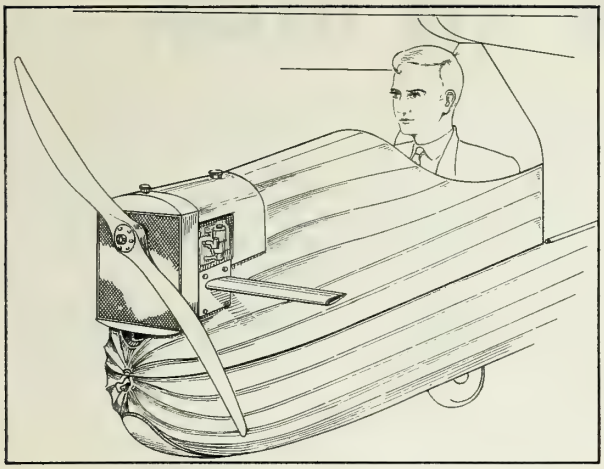
Alexander deserves much credit for tackling the difficult problem of a coupe model in the light plane class. Powered with the Continental 38-horsepower engine, the ship gets away from the Colorado Springs field, which is 6,200 feet up, without difficulty. The top speed is reported at 85 and speed range around three. Net weight is 550 pounds and gross weight 960 pounds. Seats are staggered and designed for chutes; control is dual stick; side doors are large, windows well-placed and vision good. Alexander is looking will ahead and the progress of this product will be followed with interest,

Several new aircraft engines were on exhibition or installed in demonstrators. Prominent amongst them was the Guiberson "Aero Diesel" made in Dallas, Texas. Of the nine-cylinder radial, air cooled type, it develops 250 horsepower at 2,100 revolutions per minute and weighs 492 pounds less starter. A single valve is used and the compression ratio is 16 to 1.

Interesting two-stroke engines of the radial, air-cooled type, were the Hurricane eight-cylinder, made in Houston, Texas, and a six-cylinder job by the Augustine Motors Corporation of Buffalo, N. Y. The former develops 150 horsepower at 2,000 and weighs 225 pounds with Delco ignition. The latter develops 70 horsepower at 2,100,



Looking down the aisle of the exhibition tent annex at the Air Show



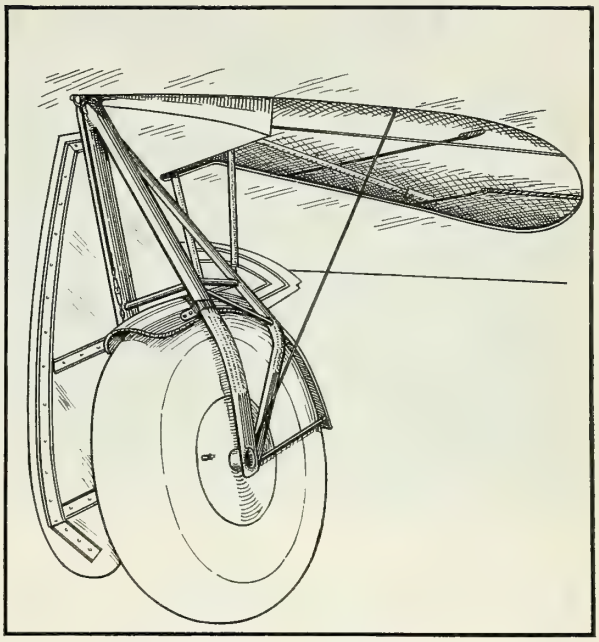
Andrews outboard motor installed in the Franklin

against a weight of 160 pounds. Due to the extreme simplicity and low cost construction of these engines, further developments will bear watching.

New light plane engines included the approved two-cylinder opposed Aeronca E 113 rated at 38 H. P. at 2,520; the approved Y type Szekely of 45 H. P. at 1,750; Aeromarine Y type, of 45 horsepower at 2,000; Poyer Y type of 40 horsepower at 2,200; and the Continental A-40 four-cylinder double opposed, of 38 horsepower at 2,800. All are air-cooled.

Chief among the improvements noted in standard engines was the addition of a Veeder revolution counter on the Warner Scarab. The counter is built into the crankcase in a way to prevent its being tampered with and from it the numbers of hours the engine has been in use may be closely approximated. The Scarab also has been equipped with a generator and battery ignition, the weight being two pounds less than the magneto-equipped model. It may be of passing interest to note that Warner is supplying cylinder assemblies for the Aeronca E-113 engine.

Numerous recent developments in the accessory line were on exhibition. Variable pitch propellers were shown by Curtiss-Wright and Hamilton Standard, the former electrically actuated by a small motor encased in an extension of the propeller boss, and the latter manually operated.



Retractable landing gear on the Lockheed "Orion"

The Waco company presented a very sensible improvement in combining an exhaust collector and Townend ring on a Warner engine. The ring is supported entirely by the individual exhaust manifolds, thereby doing away with the usual ring supports as well as the ring itself. In addition to the advantages of lower cost and weight, and simplicity, is the silencing effect of the ring due to the enlarged cooling surface and the resulting contraction of the exhaust gases.

Aircraft Products Corporation affected something new in the Perry Ski-wheel unit, an accessory that should find favor with the airlines operating in snow-bound latitudes. The wheel maintains its position with respect to the ship while the ski is moved forward and upward using the wheel axle as the fulcrum.

An inexpensive stall indicating device was incorporated in the Curtiss-Wright Junior, consisting of a small flat plate mounted in the window top of the forward deck and actuating, by means of a piece of spring wire, a pointer

(*Continued on page* 122)



General view of exhibits in the tent annex at the Detroit Aircraft Show

THE VALUE OF AIR RACES

By

William Wait, Jr.

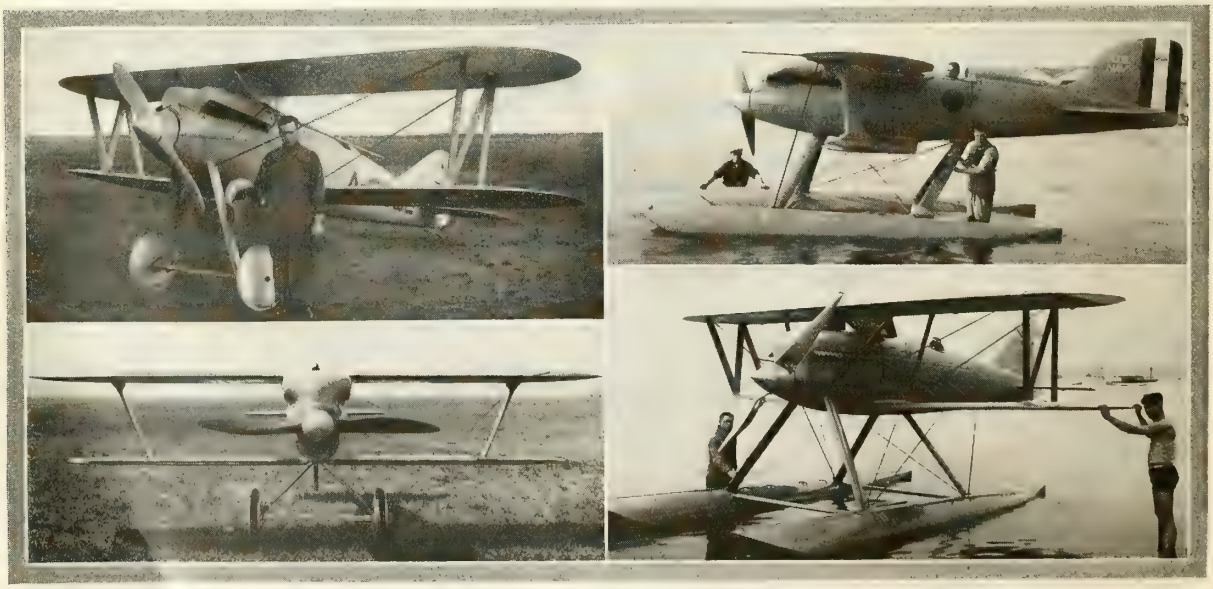
THIS article is not an attempt to predict the future or to explain the past but merely an attempt to set forth the writer's views on the value of airplane racing, gleaned from a decade of rather intimate contact with it. Mr. Wait has always been interested in racing and its effect on design. In 1920 he assisted in the design of the racing planes built by the Curtiss company for the Gordon Bennett Cup Race; subsequently when that company embarked on its racing program which was destined to change the whole concept of aircraft speed possibilities, Mr. Wait was in charge of the design and operation of each series of racing planes as it was developed.—Editor.

ALL airplane racing up to the time the Gordon Bennett planes were designed in 1920 was done with planes of rather conventional design. Except for a few notable exceptions, such as the Deperdussin monoplane, the racing planes gave no glimpse of what might be expected in the future of high speed development. In 1920 the Curtiss company had available the first really successful high speed high powered engine. Previously all successful engines produced had been of designs embodying large projected areas which made them unsuited to racing; but this engine had small projected area and its power was generated by operating at an increased number of revolutions per minute rather than by increased piston displacement.

A study of successful racing machines (whether for land, air or water) shows that invariably the winners have had the advantage over their competitors in some phase of design. Not that they have been freakish, but that their designers have concentrated on and succeeded in improving details that the others missed. Improvement of this kind is so rapid that the loss of a year's time is enough to cost twice that time for a designer to catch up.

It was apparent then that the easiest way to obtain greater speed than our competitors was to reduce the resistance of our airplane to a minimum, for our motor power was not great enough to give us any decided advantage, but its projected area was so much smaller that we had a big advantage in that respect. Laying out our airplane along these lines, we succeeded in producing a plane which was conceded to have great speed possibilities. This ship never had the opportunity to demonstrate its speed, for it was wrecked in a test flight in France before the race. Because of the subsequent elimination of the other faster competitors for various reasons, France won this race with an airplane that was practically a "cleaned up" military pursuit plane. After our plane was returned from France, a set of triplane wings originally built for a two-place plane, but with a reduced span was fitted to the racing fuselage. This plane was later flown in the 1921 Pulitzer Race at Omaha and also on Long Island in preparation for the 1922 Pulitzer Race. Even with these triplane wings the plane was much faster than the plane which won the Gordon Bennett Cup for France in 1920.

In 1921 another series of racing planes known as the CR-1's was built, but instead of following along the more radical lines of the previous year's racer, a design was drawn up along conventional lines which, although it had more power, was nevertheless considerably slower than the earlier type. As racers, these planes showed no improve-



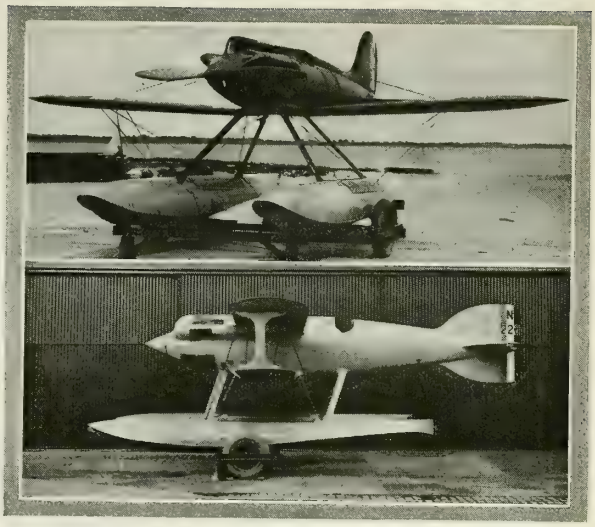
Curtiss racers that have figured in the Pulitzer and Schneider Trophy contests. Upper views, the CR-1, entry in 1921, the R3C-4, 1926 design; lower, R2C-1, 1923 Pulitzer entry; CR-3 and Lieut. David Rittenhouse (in cockpit), Trophy winners in 1923

ment at all over the previous year's efforts. They really were an excellent, although costly, demonstration of the fact that successful racing planes must be designed in every detail for the prime purpose of maximum speed.

In 1922 we set to work to build a racer taking advantage of all that we had learned from previous designs. A fuselage still smaller in cross-section than that of the Gordon-Bennett plane was laid out; a new wing section having a lower drag coefficient, was developed; a landing gear was installed that was so nearly completely composed of wire braces that pilots cast many a dubious glance at it before being convinced the chassis was safe to land on; tail skids consisting merely of laminated hickory springs were used which, although not the best for rough landings, contributed almost no drag at all. All these features added miles an hour to the speed of the plane. And last but not least, wing surface type radiators were installed which were probably the greatest single contribution to high speed that has ever been made. Radiators of this type have been used on every successful racing plane since then. Without the adoption of surface radiators for cooling oil and water, the speed records of today would be unattainable. The planes were equipped with the first of the D-12 engines delivering a maximum of about 460 horsepower. The result of the combination of these radical details was the production of an airplane known as the R-6 which won the Pulitzer Race at Detroit at a speed of 205.8 miles an hour. This was the first airplane on record ever to have exceeded a speed of 200 miles an hour. A couple of days later General William Mitchell flew one of these planes over a one-kilometer course at a speed of over 225 miles an hour. This same year the Curtiss company built the first really high speed pursuit plane; the PW-8; its design was based on lessons taught by racing, even to the use of wing surface type radiators. This plane was far ahead of anything in its class and the Army Air Service equipped the First Pursuit Group at Selfridge Field with ships of this model. As a criterion of how close these planes came to racing performance, it is interesting to note that in the 1924 race for the Mitchell Trophy at Dayton between these planes flown with standard equipment, Lieut. Cy Bettis won the event by flying at an average speed of 175.5 miles per hour!

The demand for still more speed persisted, and in 1923 we designed and built a new type known as the R2C-1 which, although it followed generally the lines of the previous racer, was considerably cleaned up and refined in many details. A careful analysis of the drag characteristics of the older planes showed what points to concentrate on. When we finished our work the cabane struts had been eliminated completely, the landing gear still further refined by building the shock absorbing system into the wheel hubs, and the cross axle reduced to a mere tension member by eliminating the bending in it. An entirely new wing section was developed in the wind tunnel, and the wing truss was so laid out that the wire angles improved the structural as well as the drag characteristics. These planes were equipped with Curtiss D-12-A motors which produced about 510 horsepower and also with the first Reed type metal propellers to be flown in competition. The resulting racing planes, when flown in the Pulitzer Race at St. Louis, exceeded the previous year's record by nearly 40 miles per hour, the winning plane averaging better than 248 miles per hour.

The year 1923 marked another increase in speed progress

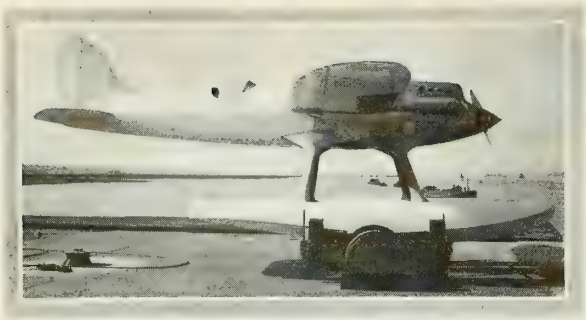


Gloster-Napier entries: Upper, the VI, lower, the IV

when the Schneider Trophy was won by the United States at a speed of 177.38 miles per hour with a plane known as the CR-3 made up by fitting a pair of floats to the 1921 racers and installing a more powerful engine. Up to that time most of the races for the Schneider cup had been flown by flying boats speeded up as much as possible. From this year on the racing was to be between highly specialized racing seaplanes which were eventually destined to exceed the landplanes in speed.

The next year, 1924, no new racing planes were built, but a new high speed pursuit plane known as the PW-8A which took advantage of a great deal of the racing experience was developed for the Army. Unfortunately this plane was never flown as originally planned until 1927 when it was raced as the XP-6A at Spokane by Lieut. Batten who won the Free-for-all Pursuit Plane Race at a speed of 201.239 miles per hour. It will thus be seen that in two short years the lessons learned from racing enabled a fully equipped pursuit plane to equal the speed of the 1922 racers.

In 1924 both the Army and the Navy, appreciating the need for further high speed development, jointly ordered the Curtiss company to build them duplicate racing planes with a third similar ship as a spare. These planes were to be designed to be flown as landplanes known as the R3C-1 for the Pulitzer Trophy and later as seaplanes known as R3C-2 for the Schneider Trophy. In general outline these planes resembled the 1923 racers, but unapparent modifications gave them considerably more speed. A new wing section known as the C-80 was developed; an extension crankshaft was fitted to the engines which gave a better streamline to the nose of the fuselage; a new forged type Reed metal propeller with better blade sections near the hub was built and finally a new type Curtiss engine known as the V-1400 developing about 600 horsepower was installed. As landplanes they were flown by Lieutenant Bettis of the Army and Lieutenant Williams of the Navy, and in level flight attained speeds of more than 260 miles per hour. After the Pulitzer Race, which was won by Lieutenant Bettis, the planes were shipped to Baltimore and fitted with floats for the Schneider contest. As seaplanes they were flown by Lieutenant Doolittle of the Army





Left: The British Supermarine S-4 monoplane, the Napier Lion powered 1925 entry; right: Supermarine S-5 monoplane, winner in 1927

and Lieutenants Cuddihy and Ofstie of the Navy. England was represented by two types of seaplanes. The Supermarine firm had built a monoplane known as the S-4 around the Napier Lion engine. Great speed was expected from this plane, but unfortunately it crashed during the trial flight. The other British entries were Gloster III's also equipped with Napier Lion motors, but they were hardly clean enough aerodynamically to be a serious threat in the race. The Italians were represented by two Macchi M-33 monoplane boats equipped with Curtiss engines. These boats were beautifully built, but it was apparent that they had not nearly enough speed to compete with the float type racing seaplanes. The Schneider Trophy was won that year by Lieutenant Doolittle, and a few days later he set a new world's three-kilometer speed record for seaplanes by averaging 245.7 miles per hour in level flight (no diving now being permitted by the F.A.I.) during trials for the straight-away speed record. The fact that the British and Italian planes were defeated in this race was no reflection upon their designers or pilots, as later events showed, but was solely a result of the fact that they had had no serious competition to force them to the extremes of necessary aerodynamic cleanliness.



Supermarine S-6, British winner in 1929

The story the next year (1926) was very different. The Pulitzer Trophy Race was abandoned and no new racing planes were built. An attempt to defend the Schneider Trophy was made by fitting larger engines into the 1925 planes. The Naval Aircraft Factory built a new nose on one of these planes around a geared Packard engine, calling it the R3C-3, and the Curtiss company installed a new Curtiss V-1550 engine developing over 700 horsepower in one to be known as the R3C-4. The Curtiss plane was tested on Long Island Sound by Lieutenant Conant of the Navy, attaining an unofficial but accurately timed speed of over 255 miles per hour. Unfortunately, Lieutenant Conant was killed in an accident to his service type plane on his way to Norfolk, the scene of that year's race.

Both American entries were severely damaged in test flights at Norfolk. The Packard motored plane overturned due to "stubbing the toe" of a pontoon in rough water and the Curtiss plane had motor trouble; an error was made in the grade of fuel installed for a test flight, causing the motor to detonate so badly that it was ruined, and the wing radiators were almost completely destroyed by the steam which formed. A new motor was rushed from the factory and installed and an attempt made to repair the damaged radiators, but test flights showed that the accident had caused the loss of more than ten miles an hour to the speed.

On the other hand, the Italians arrived at Norfolk with a fleet of Macchi M-39 racing seaplanes that were marvels in detail refinement. Their designer had profited by the lessons of the previous year's race, and there is no doubt that the attention they paid to minute details won the race for them. They had perceived the futility of attempting to compete with machines that were not much more than half-formed ideas and (*Continued on page* 132)





Left: Macchi M-52, Italian entry in 1927. Right: Curtiss-engined Macchi M-33, Italian flying boat entry in 1925

RUN OF THE NEWS

By Don Rose

IT was my settled intention to get out to the Detroit Show, honestly if possible or else as traveling companion to some lonesome pilot. I didn't make it. But it wasn't for lack of trying.

For weeks in advance of the event I sprinkled hints up and down the Eastern seaboard that any west-bound pilot who disliked solitude could have me for an attendant valet, lady's maid, porter, messenger boy or spare tire, provided he would set me down in Michigan in fairly good condition in time for the big show. My campaign was a total bust until two days before the opening. But just when I was resigned once more to the fact that it is about as easy to ride dead-head on an airplane today as it is to travel as a stowaway in a trans-continental mail coach, I got word that under certain conditions and circumstances I would be tolerated on a west-bound craft that was leaving at 7:30 on Friday morning.

I decline to mention the name of the gent who made this big-hearted offer. If I did, he would enjoy as much peace and privacy during the open season for hooking rides as the winner of the Grand National sweepstakes. He deserves better than that, and his secret shall be kept. All I shall say is that it wasn't Charles Levine nor any of the lady pilots. If I had made the trip, I could have looked the whole world in the face without a blush.

In view of the impending expedition, I negotiated a day or two off from the scene of my more serious labors. I cashed a big check, figuring that five dollars wasn't a bit too much to take on such a trip. The pilot was particular about excess weight, so I fasted for twenty-four hours and bought a new shirt for 79 cents. At that price there's nothing left of a shirt except the absolute essentials. I also had a haircut and removed from my pocket book all unpaid bills, membership cards, complimentary calendars and telephone numbers. I expected to get there all right, but from what I read in the papers I gather that a man who gets into an accident is likely to be known by the telephone numbers he keeps.

Bright and early on Friday morning I reported to my pilot. He couldn't see me for weather reports. It was raining over the Alleghenies and around Cleveland; also in Cuba, Ireland and Montenegro. He said I would get wet and that he would probably drop me somewhere in Ohio and let me walk home. He spoke gloomily of an overnight stop at Toledo, with no money and no telephone numbers. He glared at the bright blue April sky until it practically burst out crying. Somewhere to the far West he could see snow, sleet and line squalls, with possibilities of thunderstorms and heavy hail.

So we gloomed around together for a while and then I went down town to work. In spite of which, the Detroit show seems to have gone off quite nicely. I hear as much from those who were there, but I think it should be said that nobody would have known it from the Eastern newspapers. Once they got the show open, they seemed to be fed up with it. Either they don't approve of Detroit, or else the publicity department of the management couldn't think of anything interesting enough to amuse the effete Easterners. For a big show, it made very little noise outside the industry. My suggestion is that General Smedley Butler be hired to press-agent the next one.

However, that may be no more than should be expected. And in honesty to the newspapers, they have given us good measure of space and kind words since aviation set up in business. And in evidence of their respect for us, it is interesting to know that fifty important newspapers in this country have their own airplane and one—the *Detroit News*—was the first purchaser of a commercial Autogiro.

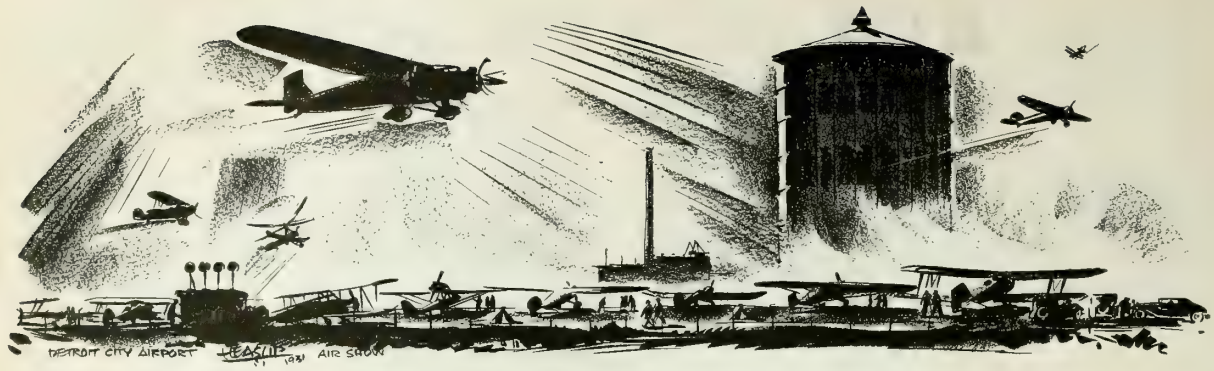
And speaking of the Autogiro, it is being said on the Rialto that the biggest, neatest, cleanest and most comprehensive piece of high-class publicity of recent date was the landing that Jim Ray made on the White House lawn and the attendant circumstances of the presentation of the Collier Trophy. That, by the way, is a good thing not only for Harold Pitcairn and his wandering windmills but also for aviation and the public's better education. It needs to be mentioned now and then that the work of designers and engineers is the stuff of which aeronautical progress is really made. Nobody ever won the Collier Trophy except in the sweatshop of science. But unless a lot of work had been done to deserve the Collier Trophy, there would be no fancy flights to capture the public's attention.

Another useful award was the Harmon Trophy which went to Major James H. Doolittle, for no reason at all except that he achieved a marvelous feat of blind flying which nobody outside the industry had hitherto appreciated. This bit of news gave the public pause, and here and there somebody woke up to the fact that flying by instruments is very high-hat piloting. The average man in the street has somehow got it into his head that all a pilot needs to do nowadays is to watch his gasoline gauge and a few other gadgets on the instrument board and the plane will practically fly itself. He wouldn't think so if he tried driving his own automobile downtown while sitting under the hood with a map and an earth inductor compass.

The Department of Commerce evidently doesn't think so. The new regulations are fairly particular as to who flies the transports and how. And though ambitous young pilots and shadyside operators may think the D. of C. is getting too fussy to be funny, the fact is that aviation's best friend sits in Washington and thinks up new nuisances for the industry. Whatever else may happen to commercial aviation, it isn't going to be allowed to go out without its rubbers and a clean handkerchief. It is better protected for the public welfare than any infant transportation industry has been since wheels began to turn. Somebody should take up a collection and give the Department of Commerce a loving cup. Or a nice desk set, maybe, or a mantel clock. But the way things look just now, it will probably get nothing but a deficit.

It should be observed that the new regulations take the trouble to put gliding and parachute jumping on a respectable footing. That serves to show that gliding is competing vigorously today with backgammon and bridge as a popular diversion. And it's a big help to distressed parents. If the son shows a tendency nowadays to slide off the roof on a glider of his own design and manufacture,

(*Continued on page* 118)



HIGH LIGHTS and LOW LIFES at the AIR SHOW

by Caldwell

Artistically assisted by Bill Heaslip

WELL, folks, I suppose you'll hear of my loss of prestige and social position at the National Aircraft Show, so I'd better come clean and explain about it myself. Perhaps you've already heard some garbled version of the deplorable affair. But try to keep an open mind until I tell you my side of the story.

And I'll admit frankly that my defense is thin. In fact, all it is, boiled down, is the well-known, "I forgot." But that's the honest truth. I simply forgot I wasn't supposed to do it. This ghastly error of memory, however, has undone my work of the past two years, and now I face the task of starting all over again, and at my time of life, too.

It happened like this: I had an afternoon appointment in New York, a morning appointment in Cleveland, and a conference in Detroit that same afternoon. Of course, the only way to get from Cleveland to Detroit in time for that conference was to fly. Carelessly, and not really thinking, I wrote Tex Marshall of the Trans-American Airline Corporation, Division of Thompson Aeronautical Corporation, to save a seat for me on the three o'clock Loening for Detroit. I told him that if the pilot who dropped me into Lake Erie two years ago was no longer with them I'd be willing to take a chance on his airline. Otherwise not. Well, he wired back that I shouldn't hold that pilot against them, as he had been the direct cause of my establishing a reputation as a long-distance swimmer. Besides, he apparently had learned enough in that one crash to write Safety Bulletins for two years, and was making an honest, if precarious, living as a before-taking exhibit.

With never a thought of what I was doing to my reputation, I got on the train, kept my appointment in Cleveland, and had time for lunch with Ed Thompson and Tex Marshall. We spoke of the Aircraft Show—and still I did not suspect that I was trembling on the verge of disaster. Even when I noticed an executive from a famous aircraft factory sitting nearby I didn't have a quiver of the intellect. In fact, it was only after he mentioned that he was going to Detroit that the full extent of my predicament dawned upon me. "I'm going over myself," I said innocently, "on the three o'clock Duck. Are you going along then?"

He started back as though a bee had stung him, and stared at me with horror in his eyes. "Why no!" he exclaimed. "I am going over on the train!" I perceived in an instant that he simply couldn't afford to be seen with me. I saw, too, the terrible thing I had done—the irretrievable damage I had inflicted on my reputation as a man of affairs in aviation. I was going to fly to the Show!

Partially stunned. I fell forward into my bowl of crackers and milk, but was rescued and wiped off by the waiter. "What is the matter, Sir?" he inquired. "Are you ill?"

"Worse than that," I groaned. "I am ruined!" Hastily I took a sip of water, and continued: "You see before you the shattered wreck of one who for nearly two years has striven to become an executive. I have spoken favorably about the airlines—and kept off them as a passenger. Having for fifteen years made a living as a pilot, I have earned the right to become a high-powered executive—and to travel by train. In company with other executives—professional and amateur—I have been God's gift to the Pullman Company. With them I have sat in Pullman compartments, going over at length what was wrong with aviation, and occasionally mentioning the poor fellows who had to fly the airplanes to the Show. And now"—I burst into tears—"I have undone it all."



"Collapsed into the milk"

Well, Ed and Tex and the waiter did their best to comfort me. They suggested that I tear up my airline ticket. But I realized I couldn't do that; I had to be in Detroit in an hour, or miss that important conference. I had to fly; there was no way out of it. If there had been, I would

have thought of it, for I was almost an executive.

By this time I was hysterical and biting the tablecloth. They saw it was no use trying to cheer me up, so they got me out of there, took me to the dock, and threw me aboard the plane. "Nobody knows you here," whispered Ed. "There isn't an executive aboard. They're all speeding along on the New York Central. You can travel incognito. Your old friend Captain J. Otis Beard is flying you over. You won't have to swim this trip. Good-bye, and God help you."

The kind fellow wiped away my tears with the engine cover, waved his hand, and we were off. Soon as we got into the air I was all right, and by the time we hit Detroit I was almost resigned to not arriving as an executive. After all, I still have a few years ahead of me, and with patience and care and forethought I yet may become something worth while in this business and be allowed to ride along in the Club car with the Big Shots.

Well, let's forget my fall from grace and jog along to the Show. I met only two of my six readers there, so for the enlightenment of the other four I'll jot down my impressions. You know, I've been going to these shows as a Paid Observer ever since they started, and each year I wonder anew what in the world I can find to write about that I haven't worn out in previous years. It certainly speaks well for the inventive genius of the aircraft industry that I can find something new each year.

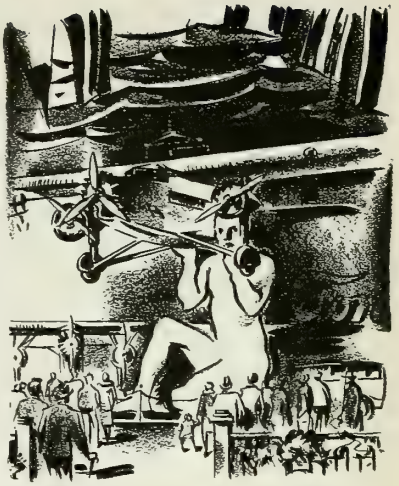
For instance, the statue of somebody upholding the aviation industry was a most unique exhibit put on by the Ford Motor Co. I tried to find out just who it was supposed to represent, was unsuccessful. All I could discover for certain was that Billy Brock and Frank McKay had posed for the statue, which strongly resembles them and a Mister Hercules, except for a couple of details.

Whether or not this statute was supposed to have any symbolic meaning, I couldn't determine. But the fact that it was supporting an aircraft and was made only of laths and plaster may be significant. Because the plaster figure was not actually supporting the airplane, which was suspended from the roof, some were led to conclude that the creation represented the National Aeronautic Association in one of its publicity moments.

To me the light airplanes were the most hopeful feature of the show. I may be wrong—I've been wrong before, unfortunately—but it seems to me that at last we're getting all lined up to enlist the interest and support of the individual of moderate means. We've spent years hopefully trying to sell five and ten thousand dollar airplanes to gentlemen with fifteen hundred dollars in the bank, but now we're getting out something he can afford to buy and operate. I believe the movement will get a good start this year, even if general business seems slow, and with the resumption of the general prosperity that seems normal to this country the light planes should sell in numbers sufficient to satisfy all but the most wildly optimistic.



The smoke-screen brigade


Upholding the aviation industry

However, it isn't going to be good enough merely to take a look at a big expensive airplane and then try to build it little and cheap. New principles of detail design must be thought out, and new and efficient production methods must be employed if the result is to be a good small airplane at a reasonable price. I feel that it would be unfair at this stage of its development to single out any special light airplane for praise or censure, for the whole movement is practically in its infancy, and everybody's trying hard. Besides, I'm not a technical man, and don't want to put myself in the position of setting up as an authority, if for no better reason than that aviation is the one business in the world where practically everyone in it feels that he is an expert on every phase of it.

However, it is safe even for a casual observer like myself to mention that the sign, "Fittings by Woolworth," will not sell many airplanes. I saw some hardware and some workmanship that wouldn't have added much tone to a hen-coop. It does seem possible that these little planes can be made cheaply without making them what is usually called cheap and nasty. But this phase will work itself out. The good ones will forge ahead and the poor ones will drop out.

I was surprised how warm it was in Detroit, for it had been quite cold in New York. But then I remembered that it's always warm in Air Shows, irrespective of the time of year. Look how hot St. Louis was last year. Yes, and New York was sweltering early in April when they put on the show there. Doctor Kimball of the Weather Bureau can make nothing of the problem, which was turned over to Psychopathic Research, Inc., a division of Cy Caldwell, Inc., which can't be divided further except by taking me apart personally, which many would like to do.

Psychopathic Research, Inc., reports to the parent company that the heat of these early spring Air Shows is due solely to hot air generated by the super salesmen and palpitating public relations counsel. Be that as it may, I notice that the formal announcements of hundreds of airplanes sold were not in evidence this year as they were two years ago. It was not nearly so Van Sicklen. In fact the temperature this year was only slightly above normal, and we'll have to wait for really boom times to get sweltering weather again.

And—would you believe it—the demon demonstrator was held back this year. The airplane zooming off the ground, clinging desperately to its prop in a climbing stalling turn, was missing. So also were the airplanes scooting across the airport in every direction. And nobody dived at the hangar with roaring motor and flashing eye, as he did at St. Louis last year. I didn't know what to make of it, and began to feel that I wasn't really at an Air Show, until I discovered the reason in a set of rules issued by Perry A. Fellows, Engineer-Manager of the airport, concluding with the disheartening words: "Rules will be enforced by Department of Commerce Inspectors stationed at the Airport."

This tough Fellow began his little list of rules for the suppression of the mighty with a few gentle remarks on routing traffic, circling the airport to get in line of traffic, take-off and landing points, and minimum altitude over airport or adjacent thereto, 1,000 feet. Then he just came out flat and said:

"No stall take-offs, zooms, or climbing turns will be permitted on take-offs *and such maneuvers will be regarded as acrobatics.* Planes taking off will clear the boundaries of the field before commencing the first turn, which must be to the left. No acrobatics except over the vacant area north of the airport. Parachutes must be worn in all acrobatics."

He ended with the brutal statement: "These rules will be enforced." He didn't say, "It would be sweet of you to try to remember not to break the rules." The result was that all you saw were airplanes sedately marching into the air, or tamely gliding down again. The close shaves and the exciting collisions of past years were missing, as were the breath-taking acrobatics. I didn't even see anyone trying to do wing-walking on the Autogiro—I had thought that by 1931 our stunt experts would have progressed that far. But there's still the National Air Races.

It was a fine show that Ray Cooper, the old Maestro, put on. What Cliff Henderson is to the Races, Ray is to the Show end of the industry. They are two good men in the right jobs. Incidentally, what a relief to have only one show! Not only a relief to those who feel they must visit all shows, but especially to the manufacturers who pay for them. Last year some of the boys had such heavy show expenses that they had to don false whiskers and go selling popcorn to the visitors to pay their hotel bills.

Speaking of hotels, some of the more moderate priced ones got a break this year. I noticed one aristocratic Aviacrat who always had a luxurious suite at the Book-Cadillac roughing it in a three dollar room at the Fort Shelby. I asked him if he was slumming. It seems that when a Great Octopus loses millions a year that retrenchment hits even the Great and the Near Great among the little Octopii.

I see by the Registrations Department in Larry Nixon's publication that Casey Jones now runs in two sections, like the Twentieth Century Limited. He was listed as "Jones, Casey," and right below as "Jones, C. S." I believe he got divided during the Great Upheaval of 1928 and on. As a purchaser of vast tracts of virgin forest to be manicured into airports, he doubtless was C. S. Jones, Esquire, but as a purveyor of pertinent facts to the newshawks he changes, chameleon-like, back to the less formal Casey of years gone by. He must have to live on a sort of sliding scale. When C. B. Allen meets him he's good old Casey with the latest dope. But if he by chance encounters anyone from whom he bought an airport he must do a Doctor Jekyll and Mr. Hyde, emerging as the gentleman with the check book and the Last Word on the Propolition. He frequently must find himself in need of a direction-finder. Ah, well, it's the age of specialists, no doubt.



You can't mention specialists without making us think of Bill Long of Texas. He specializes as a Purveyor of Grief to the Mexican nation. He was at the show, Bill was, carefully inspecting the 1,000 foot long hangar. "You'll find this kind of hard to move to Mexico, won't you, Bill?" I asked him. But he pretended not to understand me. He's a great old Bill. What a Congressman he'd make! On the Appropriations Committee.

One thing I missed at the show was the snappy display of mannish attire that in the past was the distinguishing characteristic of the woman pilot. I didn't see a single girl in a pair of pants. At first I was inclined to blame it on the depression. I heard that some of the men had lost their shirts, so why shouldn't the girls go them one better? But Secret Service, Limited—another division of Cy Caldwell, Inc.—informs me that the real reason for the girls' changed appearance is that some old fellow writing for AERO DIGEST had kidded the pants off them. I sincerely hope this report from my operatives is untrue, and that the girls will be strong minded enough to pay no attention to this old rascal. Girls, don't mind him; he's simply jealous because he doesn't look as fetching in pants as you do. He's worn pants all his life and nobody bothered to look at him. And when he sees you girls the focal point of all eyes, he just burns up. Don't let him Cyde-track your nether garments—bust out at Cleveland in all your former glory.

An interesting exhibit was the Ice Overshoe, or De-icer developed by the B. F. Goodrich Co. That's a sort of outer skin of rubber over the struts, wires, and leading edges of airplanes to throw off the ice. When ice forms they shoot compressed air into the de-icer, and off goes the ice. The first time they inflated it off went Lee Schoenhair. He is now one of the Goodrich Alumni Association, of which I am a charter member. This is a very select little association, and Lee and I feel much more exclusive than the Curtiss-Wright Alumni. They had a dinner, by the way, and I suggested that they invite the King of Spain and Big Bill Thompson to become honorary members.

They say that every man must go through just so much suffering every year so he may feel assured of a varied life. I believe I drew my entire issue of static suffering at an S. A. E. meeting, when several engineers got up and addressed us on various abstruse topics. The Society for the Suppression of Surplus Words should get after those fellows. They refuse to spare you a single fact, and don't leave out any words they can get in. I believe that the nearest thing to perpetual motion is a good engineer making a speech on a subject he is well up on. It seems a pity, too, when one determined man with a machine gun could end it all. Sitting there, I came to the conclusion that one may pay too much even for a free luncheon.

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AIR—HOT AND OTHERWISE

Shows and Shows

By Frank A. Tichenor

DETROIT has done it again—quantity production of success. Something almost uncanny about the symptoms that the world's greatest automobile center proposes to become its greatest airplane center, also. Brains. Minds which understand that business competition is the life of trade, but also comprehend that business coöperation is its soul. The prosperity of every worth while business man helps that of every other business man—who also is worth while. The others can't be helped.

Four years in succession Detroit has made its air show a record-breaker for both speed and altitude. Study the articles elsewhere in this issue to get proof of the speed; study the figures of the admissions to get proof of the altitude attained. Attendance by outsiders is altitude for any air show, for out of the general public must come the industry's future customers. We have already expressed one hundred per cent belief that Ray Cooper should be made permanent Poohbah. At Detroit he, Harvey Campbell and the rest of the gang were dazzlingly up to their best previous standards—up to them and rising. They should have permanent suzerainty (great word, eh? well aeronautics is worthy of the best Mr. Webster has in stock) over the National Aircraft Show till old age gets 'em. And we rather think they'll lick old age. Some chap is going to do it; the scientific signs that men in general will ere long benefit by it long have been in the air. Well, Ray Cooper is as good a Vornoff as any in this matter. We won't believe that Cooper can get old or let any of his group get old until we see the notices in the newspapers. Leave this crowd alone. Don't hogtie them, either, with a mess of damfool restrictions.

More than 90,000 people went to that air show and of these 81,000 paid to get into it. And—oyez, oyez, oyez!—went away feeling they had had their money's worth. Yes; and planes were sold. Lots of them. For cash. Yayuh. I actually saw some of the checks.

I had had experience at other shows at which sales managers had glibly told me they had sold planes and to my retort: "Show me!" had no better answer than a pale, sickly fadeaway. "Show me!" to these salesmen at Detroit this year in all instances brought cheerful grins, names, addresses and a glimpse at signed contracts which I could read with my own eyes. And checks—nice fat ones. Out of inside pockets.

Descriptions of the details of this show will be found elsewhere in this issue. On this page I want to speak a few words of appreciation for Detroit and its Detroiters.

They deserve the thanks of the industry very heartily expressed. They have earned the right to the 1932 show without restrictions of whatever kind. No other city in the Union can claim to be possessed of an equipment so ideal for the staging of an aircraft show. Planes, arriving from any point of the four winds of heaven, can land, have their gas drained from their tanks and be pushed by hand, forthwith, onto the very exposition floor. No truckmen this year did or could hold up exhibitors for exorbitant rates for hauling exhibits from far fields to the exhibition hall. No holdups of any kind.

Detroit is by far the best location for a show in the country, and if the Aeronautical Chamber of Commerce will have a brief attack of common sense and lay off the $7,500 "sanction fee" demanded of an exhibition city, eliminating that bit of bunco—and it seems rather silly, doesn't it?—the Detroit Board of Commerce would offer the space free to exhibiting manufacturers. They made no charges during the first three shows and probably would have made none this year had they not been burdened by that Aeronautical Chamber of Commerce "Sanction Fee." Utterly absurd, that, for the exhibition manufacturers are all members of the Chamber and, demanding this sum of Detroit as a "sanction fee," they promptly had to pay it back again (of course) as fees for space rentals at the show. Not good foresight to compel its own members to dig up money for which Detroit never would have asked had it not been paradoxically penalized for offering its hospitality. Several important members of the Detroit Board of Commerce told me that they would have been delighted to make the show an invitation affair, and would have done so, save for the guarantee demanded by the Aeronautical Chamber.

But don't let's grouch. Maybe this can be all changed before the 1932 show—which Detroit should get and be allowed to hold at a time of year when the management is sure that it can win results for the whole industry. The Aeronautical Chamber of Commerce Show Committee apparently favors January or February. The weather natural to these months, in any part of the United States wherein the show would have a fair chance of success, would be sure to hamper flying and probably cause accidents, inevitably limiting attendance and handicapping sales.

In this connection it may be pertinent to mention that during the recent show 11,135 take-offs and landings were made at the Detroit City Airport adjoining the great hangar where the show was held. While the show was on, more than 5,300 passengers were carried as sightseers over Detroit, without a serious accident.

The 1931 show beyond doubt was the greatest and most interesting, as it was the most successful, in the history of American aviation, regardless of where or when held. It taught us what to do. One of the indicated courses is to leave well enough alone so far as management is concerned. Another is utterly to abolish the silly "Sanction Fee," which really is a polite bit of racketeering. Detroit and the managerial group already organized and functioning are incapable of bungling.

AND while speaking about shows, back in June, 1930, this column rose respectfully to its two feet and said a few words about the racket operated by the Aeronautical Chamber of Commerce and the Aeronautic Exposition Corporation in connection with the then late dejected and deceased New York Air Show. Among the details of this racket was the running of an "Official Exposition Program." All the various publications which have supported this industry protested in advance against this special indication of insanity. But the Show Committee heeded not

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CURTISS MOVES TO BUFFALO

By

C. B. Allen

THE Kenmore section of Buffalo now boasts one of the busiest and most efficient aircraft factories in the United States following reorganization and consolidation under a single roof of the Curtiss-Wright Corporation's fighting plane production. More than 1,100 employees are at present busily engaged on overdue Army and Navy orders for Falcons and Hell Divers with every prospect that within a month they will be turning out these ships at the rate of ten a week. And this production easily could be doubled under existing factory facilities if a national emergency ever demanded it.

In addition to the two types of planes mentioned above the Curtiss Aeroplane & Motor Company (as the organization still is called despite the fact that all engine-building activity has been removed to Paterson, N. J., and combined there with the Wright Aeronautical Corporation) is constructing four other ships for the Army and Navy. The latter work is carried on by the experimental division of the company, recently transferred to Buffalo from Garden City, L. I., and still functioning as an independent unit within the parent organization. One of these planes, the XP-22, is a pursuit job, built for the Air Corps and fitted with a single-strut, cantilever landing gear. It is probably the only machine in the world whose chemically-cooled V-type motor and radiators are encompassed by a circular speed cowling of the sort originally designed to increase the performance of planes driven by radial engines. Another is the XF-9-C, a Navy shipboard fighter of small size and great speed which is built entirely of metal except for the fabric covering of its wings.

The other two are "mystery planes," the estimated performance and construction details of which are carefully guarded as military secrets. One is known to be an all-metal, low-wing attack plane, which was shipped to Buffalo in partially completed form when the Long Island plant of the company was discontinued. It is expected to develop a phenomenal speed and to be a veritable "flying fortress" owing to the number of machine guns and bombs that it will carry. The second one is a new observation plane of radical design, which probably will be correspondingly fast and develop an unusually high ceiling.

Transfer of the experimental division of the company from Garden City was completed about April 1 and brought to Buffalo approximately 100 engineers and fifty specially trained and skilled shop and metal workers. The Buffalo plant now embodies not only the work formerly done on Long Island but the manufacturing activities once conducted in the old and inadequate Churchill Street factory at Buffalo. The present plant, which is a quarter of a mile long and 300 feet wide with facilities for the construction of a limited flying field alongside, originally was built for the manufacture of airplane motors but has been converted into a thoroughly modern and up-to-date airplane factory following the merger of Curtiss and Wright interests into a single company. It was completed and first occupied by the motor division of the Curtiss organization on July 14, 1929, and its present value is estimated as $4,000,000.

These changes at Buffalo, the discontinuance of the Garden City plant and the transfer of all motor-building activities to Paterson are part of a general re-allocation of tasks and responsibilities within the Curtiss-Wright group. The purpose of this was to eliminate duplication of effort, reduce needless overhead, and concentrate related activities in the same place. Thus St. Louis, and to a lesser degree, Wichita, have been made the center of Curtiss-Wright commercial aircraft production; Bristol, Pa., through the subsidiary Keystone Aircraft Corporation, becomes the birthplace of amphibions and big bombers; Paterson is headquarters for both water-cooled and air-cooled motors, and Buffalo is the incubator where the company hatches its fast fighting planes—the real birds of war.

A five-day week is in vogue at the Buffalo factory. Employees and officials of the company alike appear to be well satisfied with this system although it entails rather long hours—from 7:30 in the morning until 5:30 in the afternoon—to make up a 47½ hour week. Only a half-hour is taken for lunch, most of the workers eating by shifts in the large and attractive cafeteria in the factory.

On a trip through the factory, a visitor is immediately and continuously impressed with the great increase in



Interior of the Curtiss-Wright factory at Buffalo where military plane production has been concentrated



Office building which houses executive personnel and engineering division

riveted construction over the once predominant welded steel process of putting planes together. The latter method is still employed on motor mounts and at certain other points in the structure of the ship but the ratio of fabrication by riveting compared to welding is about nine to one. Another impressive thing about the new Buffalo-Curtiss plant is the orderly completeness and self-sufficiency that it displays. Practically every fitting that goes into planes manufactured there, with the exception of the wheels, is made right on the floor of the factory so that the stress analysis engineers know exactly what they can expect from the component parts of the completed machines.

There is a physical-chemical laboratory for testing materials; anodic treatment tanks for putting a chemically pure surface on duralumin parts, so that they will not corrode and will "take" protective coats of paint; a sand-blast room for scouring metal surfaces and revealing hidden flaws; a propeller department, where experts balance blades and set them at the proper pitch for the job they have to do; and a model shop where tiny wooden replicas of ships that may or may not be built are fashioned so accurately that speeds may be calculated in advance to within one or two per cent of what the actual plane's performance will be.

All fabric-covered parts of the airplanes built at the Buffalo factory pass through a huge dope room, which, of itself, is larger than some buildings that pass as aircraft manufacturing plants. This is an erstwhile receiving and shipping room, converted at a cost of $4,500 to its present role in lieu of a $45,000 separate building for the same purpose which was at one time proposed. There are two separate heating units in this room that draw air in from the outside at the rate of 24,000 cubic feet a minute, while a huge exhaust fan carries the dope fumes out of the place to the tune of 55,000 cubic feet a minute, the additional 31,000 cubic feet of air being drawn into the dope room from the main part of the factory, thus guaranteeing a good circulation there as well.

An eight-foot wind tunnel, which has just been completed, supplies air at velocities up to 110 miles an hour as compared to the old 60-mile-an-hour speed of the Garden City wind tunnel. This affords the company's engineers a much more accurate check on the various design features, wing-sections, streamlines, and other elements which must be tested in this manner before their full-sized counter parts are incorporated in actual airplanes. A 500-horsepower electric motor drives the fan by which air velocities within the tunnel are controlled. There is a heating plant some little distance away from the factory proper where a battery of three self-stoking furnaces (only two of which ever are in operation at the same time) furnish heat for the entire factory and operate air-compressors —all on no more than a fifty-ton carload of coal a day in the coldest winter weather.

The factory has a total floor space of approximately 420,000 square feet. It is lighted not only by windows around the sides of the building but through northern exposure skylights obtained by virtue of eight saw-tooth ridges into which the roof of the plant is divided. The structure is a one-story affair save for the front part of the building where the engineering and executive offices are grouped, the former on the third or top floor and the executive offices on the two lower ones.

Extraordinarily good light and a generally striking effect is obtained on the second floor by the fact that virtually all the offices are separated by glass partitions so that everyone can see what everyone else is doing. This fact has given rise to the remark that "aircraft executives who work in glass offices shouldn't throw stones" at the efforts of their competitors, but should concentrate all their efforts on producing something worth while themselves. From all appearances it would seem that the motto is being followed pretty well.

On the northern side of the factory—the latter runs due east and west—there is a strip of ground 2,400 feet long and a few hundred feet wide which is to be cleared and leveled for use as a take-off strip so that planes can be delivered by air from the factory door. At present it is necessary to take ships either to the Buffalo Municipal Airport at the opposite side of the city or to the less distant Consolidated Flying Field for final assembly and test flights.

Chief among the officials of the Curtiss Aeroplane & Motor Company under its present set-up are J. A. B. Smith, president, who maintains offices in New York City; T. P. Wright, vice president and chief engineer in actual charge of the Buffalo plant; W. S. Leaycraft, vice president and treasurer; P. N. Jansen, factory manager; C. H. Longwell, chief inspector; and G. A. Luberg, assistant chief engineer.



Airplane view of the factory of the Curtiss Aeroplane & Motor Company, Buffalo, N. Y., where 1,100 workers are employed

NAVIGATION INSTRUCTION IN GROUND SCHOOLS

By Captain Leslie S. Potter

GROUND school instruction is usually regarded as an anathema by the student of flying, as an evil attaching itself to the thrills of flying to be obtained later. Few recognize the absolute necessity of this instruction and the security which its intelligent understanding will give to the pilot later. To those who have felt the itch for the feel of an airplane in flight, this attitude is highly understandable; but as in the case of a child who wishes to run before it can walk, instruction in flying must be controlled by those older in the game and with a better knowledge of its requirements.

Many ground school courses have been prepared and offered all over America today by groups of highly trained experts, but I still think that in many of these the minor prominence given to the subject of aerial navigation is totally incommensurate with its true importance in aviation. Such a subject as theory of flight, for example, does and should predominate at the beginning, but as the student progresses in his course, navigation ought to become at least of equal importance with the rest.

The ideal pilot would, of course, be the flier who knows more of engines than his mechanic, more of rigging than his rigger, more of radio than his radio operator and at least as much of navigation as a qualified navigator. Unfortunately, such an aerial Crichton does not exist, or—I had better qualify that statement—at least I have never heard of one.

Although it is obviously desirable that a pilot know as much of all these subjects as possible—and it may be contended that it is impossible for a pilot to check up on a mechanic's work, for instance, unless he knows at least as much as the mechanic—it must generally be conceded that anything more than a general working knowledge of all these subjects is impossible for the average person. That being so, and it being logical to believe that the absolute *essential* of a good pilot is the ability to take up a plane under almost any conditions and fly it safely and accurately to its destination, one is led to the further conclusion that the most necessary qualifications in flying are airmanship and navigation. The other subjects of training are wholly desirable and necessary adjuncts, but in the actual performance of his duty, which is to fly, these two are the essentials.

The flying instruction given today in most schools is comprehensive, for only the experience born of many flying hours is required to train an adaptable man so that he becomes a good pilot so far as airmanship is concerned. But concerning navigation the story is very different. Most people gifted with normal flying ability and eyesight can follow a road or a railway track from one place to another, but if that must be done, why not go by automobile or train? It is the ability to navigate successfully which enables a person to turn to full account the speed which is the chief advantage of flying.

In front of me as I write is the text, in book form, of a ground school course given by one of the best-known aviation firms in the country. Approximately one-third of its contents is devoted to rigging, another third to motors and the balance is sub-divided under various headings. Of its total of more than 150 pages, exactly five are devoted to practical air navigation. I have been told that, in the time available and for the fees charged, any more instruction in the subject is impossible, and that for the average flier this is unnecessary anyway. Admittedly the private flier who is flying only for his own amusement, probably only taking short flights in the best of weather, may not feel such an urgent need for a knowledge of navigation. If he does take longer to reach a destination by following a railroad, the expense is coming out of his own pocket, and it is nobody's business but his own. As yet, however, the number of persons who are taking up flying solely for pleasure is very small indeed. On the other hand, for the great majority who are taking it up commercially, this knowledge of navigation is essential both for the safety of the passenger and the successful operation of the company. The pilot who through successful navigation continually saves ten minutes on the daily run for his company, is the pilot whose position is going to be advanced the more rapidly.



Students attending a lecture on the fundaments of navigation

In other countries navigation is one of the most important, if not *the* most important, subject in the examination for pilots' licenses. In England, for example, for the obtaining of a "B" license, the equivalent of a transport license over here, a far greater knowledge of navigation is required than of any other subject. That a similar state of affairs will arrive here as the advance of aviation continues, I have not the slightest doubt. For the purposes of comparison, a specimen syllabus of the points covered in the navigation paper for the "B" license examination in England is presented here. It will be seen that a fairly wide knowledge of the subject is required.

Form of the Earth

Definitions—Change of time with longitude—Dimensions—Solution of triangles by trigonometry and Traverse tables.

Maps and Charts

Mercators and Gnomonic charts—Scales—Properties—Plotting of bearings.

Earth's Magnetism; Compasses

Elementary magnetism—Dip—Declination—Changes in Declination—Isogonic lines

(*Continued on page* 130)

EDITORIALS

EVERY LETTER BY AIR MAIL!

"EVERY letter going a hundred miles or more to be sent by Air Mail at the two-cent rate!"

That, as we have often said, should be the slogan of the Air Industry. The Post Office Department has announced payments to the railways during the fiscal year totaling $115,000,000, while to the Air Mail, foreign and domestic, was allotted approximately $20,000,000.

When this Industry realizes that practically every dollar now spent on railway mail can be diverted to Air Mail, and that the rates now paid for Railway Mail would yield Air Mail carriers a fine profit, the growth of Air Mail really will begin. If we let anybody hold us back we are, in effect, holding ourselves back. Inertia is the first thing that an airplane engine has to overcome. The inertia in the industry must also be overcome.

By authorization of the Post Office, 493 companies carry mail over 220,416 miles of railroad, slowly, expensively at an immense loss to that American business public which would so greatly benefit by the speed, efficiency and many other admirable characteristics of Air transport for mails. The air industry must fight for and get this business. Representative Kelly of Pennsylvania, a majority member of the House Committee on Post Offices and Post Roads evidently thinks it will. He is frankly, hopefully air-minded, declaring that every city in this nation eventually will be knitted into the Air Mail Service by means of feeder lines picking up and dropping the mail while in flight. He regards Air Mail as vital to commercial relationships with Latin America. He regards the appropriation of $27,000,000 for the fiscal year ending June 30, 1932, as but a beginning, and regards deficits as wholly justifiable. He believes that every one of the more than 500 cities which have petitioned for Air Mail feeder lines, connecting with the trunk lines should have what they ask, and believes they'll get it, with, presently, the whole nation covered, mails being gathered and dropped at very many points without stopping flight. He expects so great a development of the inter-American Air Mail that he advises the teaching of Spanish in all public schools wherein any foreign tongues are taught.

OH, YES—SOUTH AMERICA

ENOUGH potential trade exists, up here for South America and down there for North America, to make a high bump in depression at both ends of this hemisphere. Why should we insist on being busted just because it is the European fashion?

We don't wear spats and high hats any more, thank heaven. But we let South America slip out to sea between our fingers! England sends H. R. H. the canny, lovable, historic Prince of Wales on a frank tour of commercial salesmanship.

Lindbergh made a good will tour, and it was very valuable. No American is making a good business tour. Wales took his British planes along, of course, which made his journey not only fast and comfortable, but a great advertisement for John Bull's best ships.

Now here's a bit of a suggestion. Heaven knows we're making slight use of our Naval aircraft carriers. All wrong. Use 'em. Load them up with good American planes, those we manufacture being as good as (perhaps better than) the best H. R. H., could take from Britain, and put on board, also, our own great Col. Lindbergh, and Jimmy Doolittle and perhaps some others of our flying wonders known in South America and go the British one or half-a-dozen better.

We hear with horror that the Prince of Wales has launched a "drive" to compete with the United States, for instance, in far Chile. Counter-attack is a good move in warfare. It is a virile move. It often wins. It is as good a move in competitive trade.

And what a useful purpose for which to use our carriers and perhaps some others of our warships—now absolutely valueless and certain to become more so as a real war begins. It is the only way by means of which our taxpayer ever will get a dollar out of his expensive Navy.

AIR UNPREPAREDNESS

IN one despatch from Washington we read that the Army strives for 1,800 planes for defense, that is, planes fit and ready for war. Meanwhile F. Trubee Davison, Assistant Secretary of War for Aeronautics, warns this nation that much of the equipment designated for use during the May maneuvers, which he hopes against hope may be spectacular, would be unavailable for actual war service.

In other words our Uncle Samuel, with the assistance of the pacifists, fools himself again in this most vital matter, despite his tragic and colossal practical joke upon himself in World War time, when an indeterminable multitude of brave solders, and a staggering number of millions in money, were literally thrown away, or grabbed away, with the net result of (some say) "one American plane actually fighting in the air at the front."

The present situation, Secretary Davison says warningly, is bad, because while, technically, the Army Air Corps is on paper keeping pace with the air progress of other countries, it scarcely can become practically efficient because our tactical progress is stunted if not nullified as far as acquirement of technique goes, by our lack of planes and personnel trained to fly them. To those Americans who are opposed to necessary maneuvers, because they regard them as "gestures of war," the Assistant Secretary pays his disrespects—to which we wish to add our own.

The officers available for the May maneuvers number 797 with 687 enlisted men.

Instead of the 670 planes now actually available, there should be 2,238. Of the planes of which the First Air Division now consists a "sizable number" are unfit for combat and would have to be eliminated if war came. In full war-time strength an air division would be 4,000 officers and 29,000 enlisted men.

"We do not want war," said the Assistant Secretary, "but we do want preparedness as a form of insurance against bloodshed and conflict."

(*Continued on page* 120)

THE PILOT and the COMPASS ERROR

By

Lieut. Logan C. Ramsey, U.S.N.

Author of "The Navigation of Aircraft"
Instructor in Aerial Navigation
Naval Air Station, Pensacola, Florida

AS STATED in the article of this series appearing in the April issue, the aircraft compass is in many respects the most important instrument available to the pilot. In order that he may use this device intelligently, a practical understanding of the normal errors of the compass is requisite. With the single exception of the sun compass, which has a strictly limited use, all aircraft compasses available at present derive their directive impulses from the magnetic field of the earth. Their indications point out the direction of the magnetic flux from this field instead of the true or geographical north. Except for certain limited areas where the true and the magnetic norths chance to coincide, this factor causes an error in the compass.

Fortunately, the amount and direction of this error, called the magnetic variation, or more simply the variation, has been accurately determined for all localities within the continental limits of the United States. All maps produced by governmental agencies designed for the use of aerial navigators set forth the value of the variation for the areas covered by the map in question. This error of the compass is also noted on the Air Trail maps published by Rand McNally. If none of these various types of maps is available, the values of the variation along any route may be obtained from the Coast and Geodetic Survey in Washington. While the variation changes very slowly from year to year it may, for aerial purposes, be considered constant for any given locality. Its value is independent of the heading of the plane.

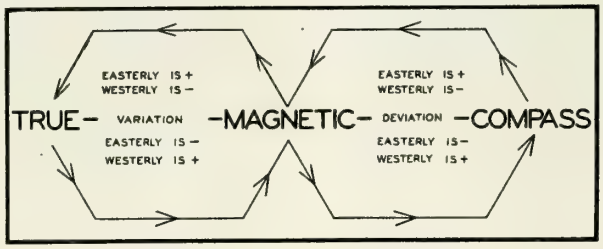


Diagram of method of calculating correct compass course

The other chief source of compass error arises from the effects of magnetic metals used in the construction of the plane. Several other minor sources of error exist but all the errors due to the surroundings of the compass and the operation of the plane are generally considered as a whole. The total error from these causes is termed the deviation of the compass. The deviation of the compass is practically independent of the geographical position of the plane and varies with the heading of the aircraft. Ordinarily, it remains constant, but may change if the plane receives a severe jolt, such as might result from a poor landing. The deviation may also be changed by the installation of a new engine or radio set, by the stowage of the tool kit in a new location, or by any other change in the metallic surroundings of the compass. A detailed discussion of variation and deviation is beyond the scope of this series of articles and those desiring more detailed information are referred to any standard text on aerial navigation.

The pilot obtains his variation from the map, but in order to determine the deviations he must align his plane on the ground along various magnetic headings. These directions differ from the true or geographical directions by an amount equal to the variation prevailing in the locality. If the effect of the variation is to pull the compass needle to the right of the true direction, the variation is termed easterly; if to the left, it is termed westerly variation. The numerical value of any direction is equal to the number of degrees in the angle between it and the north, measured to the right through 360 degrees from the north as an origin. Hence, for easterly variations, where the compass needle is pulled to the right, the compass reading will be less than the true by an amount equal to the numerical value of the variation; and this quantity must be added to the compass direction to obtain the value of the corresponding true direction. Conversely, westerly variations must be subtracted from the compass indications in order to obtain the true direction. Easterly and westerly deviations are applied similarly.

Any direction can be referred to one of three origins: if to the true north, the direction is called true; if to the magnetic north, the direction is called magnetic; and if to the north as indicated by the compass, the compass direction. Although a true direction may differ from either the corresponding magnetic or compass directions or both, numerically, actually the three refer to the same direction. For some mysterious reason many navigators, whether experienced or not, frequently apply variation and deviation in the wrong direction and consequently many mnemonic methods have been devised to prevent such errors. The writer prefers that given by the diagram in the center of this page.

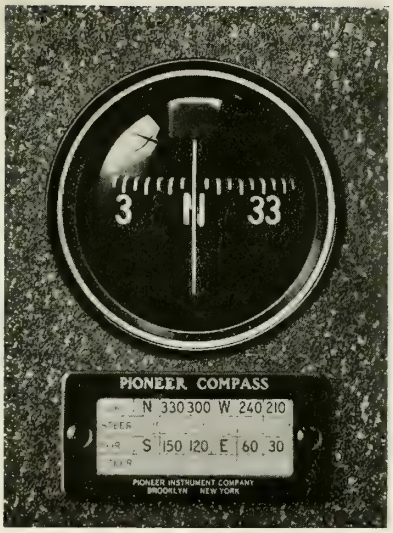
The arrows in the diagram indicate the initial and final norths of reference in the proper sequence. The quantities mentioned between these reference directions indicate the class of error to be applied to obtain the corresponding direction referred to the next origin. The symbols adjacent to each line indicate the method of applying the error in question.

For example, a pilot wants to fly between Atlanta and Pensacola. On referring to his map, he finds that the true course is 216 degrees and the variation for the locality is three degrees easterly. Many maps show the magnetic value of the desired direction of flight, in which cases the deviation only must be applied. His compass deviation on a heading of 210 degrees is, say, two degrees westerly and on a heading of 240 degrees is three degrees easterly. What compass direction corresponds to the true course, or rather, how should the pilot head by compass to make good the desired course?

The course should be calculated by applying the variation and deviation as follows:

True	216 degrees	(going from true
Variation	3 easterly	to magnetic, subtract easterly)
Magnetic	213 degrees	
Deviation	1 westerly	(going from magnetic to compass,
Compass	214 degrees	add westerly)

(The value of the deviation on a heading of 216 degrees was determined by interpolation between the values corresponding to the headings of 210 and 240 degrees. Now 216 degrees is one fifth of the way between 210 and 240 degrees. The change in deviation between these two headings is from two degrees westerly to three degrees easterly or a total change of five degrees. One fifth of this change would be one degree and as the change starts with two degrees westerly and moves towards an easterly deviation, the exact deviation for a heading of 216 degrees would be two degrees westerly minus one or one degree westerly.)



Magnetic compass by Pioneer

If, on the other hand, a pilot is in the air somewhere between Pensacola and Atlanta and wants to determine the true direction he is making good over the ground, the work involved is the reverse of the process just illustrated. Let us assume that the pilot is checking up on his landmarks and is heading in a compass direction of twenty-nine degrees. He desires to know if this heading corresponds to the true course which is, of course, the path over the ground he wants to follow. (For the purposes of this problem the wind drift is disregarded.) His variation, as he is flying over the same area as that which obtained in the last illustration, is still three degrees easterly. Let us assume deviations as follows: on heading zero degrees or north, two degrees easterly; and on a heading of thirty degrees, four degrees easterly. Now by accurate interpolation, his deviation on a heading of twenty-nine degrees is three and twenty-eight thirtieths degrees easterly. This is so close to four degrees that this figure is used. In practice, in order to determine the proper direction, the deviations and variations used are figured to the nearest half degree.

Compass	29 degrees	(Going from compass to magnetic,
Deviation	4 easterly	add easterly)
Magnetic	33 degrees	
Variation	3 easterly	(Going from magnetic to true,
		add easterly)
True	36 degrees	

As previously stated, the determination of the values for the deviation on the various headings is accomplished by alignment of the plane on the several magnetic headings. The difference between the compass reading and the magnetic direction is the deviation of the compass on that heading. If the compass reading is of greater numerical value than the magnetic direction, the deviation is westerly. Conversely, if the magnetic heading is the greater, then the deviation on that heading is easterly. Deviations are usually determined on twelve headings, each differing by thirty degrees. Let us assume that a pilot aligns his plane on magnetic directions of zero, thirty, sixty degrees, etc. The corresponding compass readings are 358, thirty, sixty-one degrees, etc., as given in the following table. What are the compass deviations?

Magnetic	Compass	Deviation
0	358	2 easterly (Magnetic greater)
30	30	0
60	61	1 westerly (Compass greater)
90	90	0
120	122	2 westerly
150	150	0
180	175	5 easterly
210	208	2 easterly
240	240	0
270	274	4 westerly
300	300	0
330	328	2 easterly

(In the determination of the deviation on a magnetic heading of zero degrees, it should be remembered that north is either zero or 360 degrees. In this instance the magnetic direction of 360 degrees is greater than the compass direction of 358 degrees and the deviation is easterly.)

Now the deviations given in the table above are those corresponding to the *compass* headings in the adjacent column of figures. To obtain the deviations on even-numbered *compass* headings it is necessary to interpolate. For example, a compass heading of zero degrees is, in the table just given two thirty-seconds of the way between 358 and thirty degrees. The accurate deviation is two thirty-seconds of the difference in deviations for these two headings subtracted from the deviation for the first of these two headings, or one and thirty thirty-seconds degrees easterly. Practically, this would be called two degrees easterly. Ordinarily, this interpolation may be disregarded, but in case the difference in deviations between two consecutive headings is greater than five degrees, a more accurate deviation table can be made by such interpolation. In the example just given the deviation table would be as follows:

Compass Heading	Deviation
0	2 easterly
30	0
60	1 westerly
90	0
120	2 westerly
150	0
180	5 easterly
210	2 easterly
240	0
270	4 westerly
300	0
330	2 easterly

It will be noted that in this example there is no change in the deviations corresponding to the even-numbered magnetic directions and those for the same even-numbered compass headings. However, suppose that data obtained had been as follows:

Magnetic	Compass	Deviation
30	27	3 easterly
60	65	5 westerly

In this case the deviation corresponding to a *compass* heading of thirty degrees would be (figuring to the nearest half-degree) two degrees easterly instead of three easterly.

The reason for converting the table to even-numbered compass headings is that in flight the pilot is enabled to interpolate easier for intermediate headings and can thus calculate mentally the correct corresponding deviation with less mental effort.

The example of the complete (*Continued on page* 136)

THE INDUCED DRAG

Article Eleven on the Principles of Aerodynamics

By

Dr. Max M. Munk

THE wing section flow by itself furnishes us the travel of the center of pressure correctly, but it gives the lift as a function of the effective angle of attack only, not of the actual angle of attack. Therefore, the knowledge of the wing section flow is not enough for the computation of the lift. Moreover, the wing section flow gives no drag whatsoever, and that is its most serious defect. Wings experience a drag in addition to the friction drag, and a theory that fails to account for that drag is distinctly incomplete.

We now proceed accordingly to complete our picture of the wing air flow, by discussing the lateral air flow, forgetting for a while the wing section flow. We investigate how the air is pushed to the two sides, and up and down, and consider the pure wing section flow as a mere detail of this lateral wing flow.

The air arriving relative to the airplane in vertical layers parallel to the span is affected by the lift in the most natural way. The air is thrown downward, deflected by the wings. As the wing or wings pass through the vertical layers, one after the other, a definite lateral air flow is gradually built up in each one, so that a wake exists behind the wing identical with this lateral air flow, although there was no lateral air flow in front of the wing.

The wake is commonly called the "downwash" or "induced downwash" of the wing, expressive of the downward motion of the air behind the wing as its most essential characteristic. It must not be supposed that the air is moving down exclusively in this downwash flow behind the wing. This is impossible because there would then occur a congestion of air in lower levels and a scarcity or vacuity of air in upper levels. As much air as flows down must also flow up. The air flows down at points directly behind the wing and moves up behind the wing on both sides. The motion must nevertheless be called a downward motion because the downflow exceeds the upflow in concentration. The resultant momentum is downward. The entire air in each vertical layer is in motion, some air moving down and some moving up. The effect of all mass forces occurring with this motion is equal to the mass force of a limited quantity of air moving downward. The effect of the air motion on the wing is the same as if the wing were in inter-action with a portion of the air in each lateral layer only, which portion is then moved down with constant velocity.

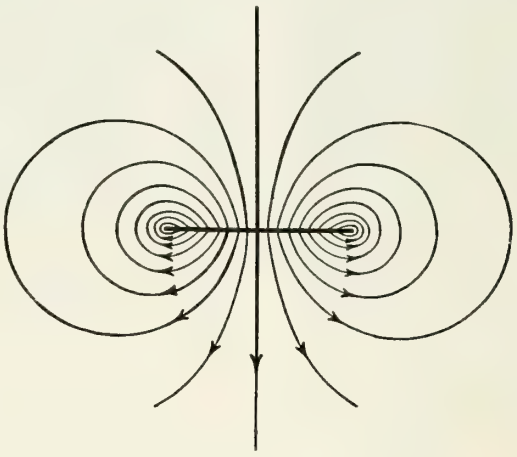


Fig. 1. Downwash flow behind a monoplane wing

In this sense, the wing relative to its lateral air flow has again a definite deflecting power, expressed by the area of the cross-section within which the deflected air might be contained. The wing appears to grip not all of the air, but only the air within a certain reach, only the air within a certain fictitious downwash cross-section moving with the wing and representing its deflecting ability. The horizontal cylinder or prism of air is originally at rest. It is thrown downward by the wing flying inside of it so that it has a definite and constant vertical velocity after the wing has passed by. With respect to the air forces of the lateral wing flow, the wing flying in the infinite air space acts as if it were flying in an air space of definite cross-section only, gripping this limited air volume fully and uniformly.

The computation of the lateral gripping or deflecting power of the wing—the computation of the cross-section of its deflective capacity—is the main numerical problem of the aerodynamic wing theory. This clearly belongs to the realm of pure mathematics. The result must agree with general considerations. It is obvious that wings extending far to the left and right, or up and down have a good grip on much of the air, and accelerate a large volume of it. The chord cannot have an effect in this connection, since the wing is advancing from layer to layer anyway, and comes into contact with all of them alike, whether the chord be large or small. Accordingly, we can expect the cross-section of the air prism gripped by the wing to depend on the span and on the height of the wing system only. The lateral deflecting power of the wings depends on their front view, or span view only.

With monoplanes, there is only one main dimension of the span view—the span itself. The downwash area of lateral deflecting power must always be the same with equal spans. The mathematical analysis of the air flow created by a straight line moving sideways gives this area equal to the circle over the line as diameter. The factor π occurs again. A monoplane throws down all air contained within a cylinder with the span as diameter. At least the resultant air forces are the same as if it did. Let b denote the span. The cross-section of the cylinder is then $b^2\ \pi/4$. The mass of the air inside this cylinder passing the airplane per second is then $M = \varrho V b^2\ \pi/4$. If u denotes the final downward velocity, the lift will be

$$L = Mu = \varrho u V b^2\ \pi/4$$

and hence

$$M = \frac{L}{\varrho V\ b^2\ \pi\ 4}$$

This requires the kinetic energy per second

$$K = \tfrac{1}{2} Mu^2 = \frac{L^2}{V\ \varrho/2\ b^2\pi}$$

The drag required to consume this energy is

$$Di = \frac{L}{V} = \frac{L^2}{V^2\ \varrho/2\quad b^2\pi}$$

This drag has been called "induced" drag by the author of this article, and that name has become universal.

We have thus obtained a result of great importance and interest. The wing, even in a potential flow, has a drag or resistance. It throws the air downward, and imparts a motion to it that continues after the airplane has passed by. The creation of this motion requires energy, and accordingly a drag occurs to make up for this energy consumption.

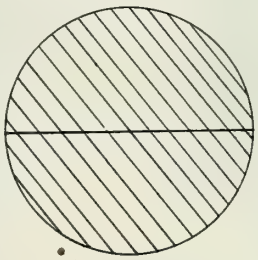


Fig. 2. Downwash area of a monoplane. The diameter represents the span

The induced drag is the air resistance consumed by the air for the creation of its downward motion. Insofar as this downward motion of the air is necessary for the creation of a lift, it can be said that the induced drag is a useful drag. It is not useful in its requirement on the airplane design, but it is useful in its effects on the air motion. The induced drag is an evil, because all drag is an evil, but it is a necessary evil at least, and expended for something we want.

With biplanes, or multi-planes, the area of deflecting power is larger than with monoplanes of the same span, because in addition to extending sidewise, such wing systems also extend up and down, and therefore have a better grip on the air. A biplane with an immense gap throws as much air down as both wings together, each acting as a monoplane, for the wings are then too far apart to interfere with each other. Each air particle is either thrown down by the one wing or by the other, but is never under the effect of both at the same time. This shows that the downwash area of a biplane with wings of equal span may be as large as twice the downwash area of the single wings. However, this is an extreme case. With biplanes, the gap between the wings is not large, but comparatively small. The air motion on top of the upper wing and below the lower wing is about the same as with a monoplane. Air between the two wings can at best be all thrown down. This assumption is rather exact with ordinary biplanes. The equivalent downwash area of a multi-plane of ordinary dimensions of its span view is equal to the area of the circle over the largest span plus the area between the spans. For a biplane with equal spans, this gives the sum of the circle over the span and the rectangle of the span times the gap.

The equivalent downwash areas of several types of span views are represented in the accompanying figures.

It is sometimes more convenient to use the circle over the largest span of a biplane rather than a composite downwash area. Since with biplanes and multi-planes even the circle over the largest span is too small, some designers use an "effective" span for the computation of the downwash area larger than any actual span. The ratio of this effective span to the largest actual span is then denoted by the span factor k.

For a biplane with equal spans b and the gap h, the effective span is

$$k\ b^1 = \sqrt{b^2 + 4b\ g/\pi} \quad \text{and } k \text{ becomes} \quad k = \sqrt{1 + \frac{4g}{\pi b}}$$

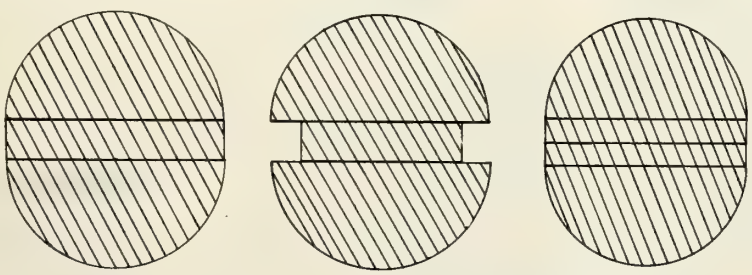
That gives indeed a circle with an area equal to the sum of the actual span circle and the span gap rectangle.

Our formula for the induced drag

$$Di = \frac{L^2}{V^2\ \varrho/2\quad b^2\pi}$$

shows that for a given lift the induced drag may be small or large according to the circumstances. The designer wants it small under all circumstances, but cannot always get it small. The formula shows him what he can do. Everything else remaining equal, the induced drag is inverse to the square of the velocity and inverse to the density. That is to say, it is inverse to the dynamic pressure which is just the opposite of what the square law prescribes for ordinary air forces. There is no contradiction, however. The square law holds for unchanged geometric conditions only, and here we change the geometric conditions. We assume constant lift at different velocities, and this is possible only if the angle of attack is properly varied. The square law refers to a constant angle of attack, and the inverse square law of the induced drag refers to constant lift and to a variable angle of attack.

Furthermore, the induced drag is inverse to the square of the span. The induced drag per unit lift contains as a factor the term L/b^2. This span square load is as important for the drag, as the wing loading L/S is for the maximum lift and hence for the minimum speed. The consideration of the induced drag calls for a large span, whereas structural requirements call for a short span. The actual design is a compromise between these two conflicting requirements. A large span cuts the induced drag down, but increases the structural weight. The induced drag and the necessity for keeping it reasonably small explain the occurrence of a pronounced span as such, in nature as well as in technics. All other vehicles as well as walking and running animals have their largest extensions in the direction of motion; only the birds and airplanes are exceptions to this rule, because with them it becomes imperative to grip the air to all sides as a means to sustain their altitude.



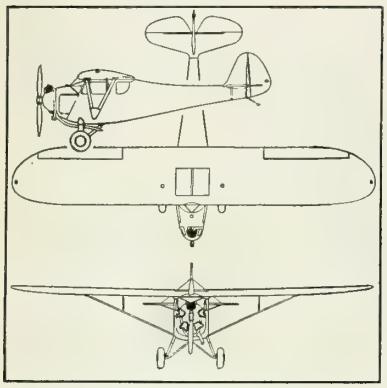
(Left to Right): Fig. 3. Downwash area of a biplane with two equal spans. Fig. 4. Downwash area of a biplane with unequal upper and lower spans; Fig. 5. Downwash area of a triplane

A large velocity also cuts the induced drag down, because the airplane then comes into contact with more air. A large velocity, however, increases the friction drag, in keeping with the square law. We expect, therefore, at a very low velocity as well as at a (*Continued on page* 130)

Approved Type Airplanes Now in Production (Continued from April Issue of Aero Digest)

MONO
MONOCOUPE 90, 110, 125
Mono Aircraft Corporation
Moline, Illinois

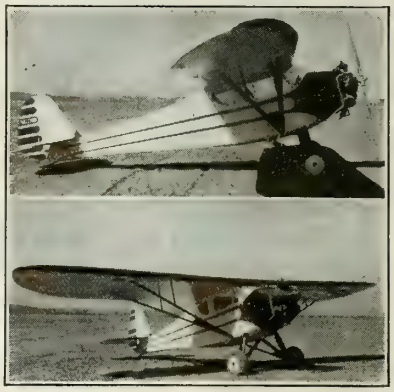
Specifications: (Models 90, 110, 125, respectively) Span, 32 feet. Length overall, 20 feet 10 inches; 20 feet 4 inches; 20 feet 8 inches. Height overall, 6 feet 11 inches. Wing area (including ailerons), 132.3 square feet. Lambert R-266 at 90 horsepower; Warner Scarab 110 horsepower; Kinner B-5 of 125 horsepower. Wing loadings, 11.3; 12.25; 12 pounds per square foot. Power loadings, 16.6; 14.7; 12.7 pounds per horsepower. Weights empty, 859; 991; 1,007 pounds. Useful loads, 631; 620; 583 pounds. Gross weights, 1,490; 1,611; 1,590 pounds.



Performance: High speeds, 116; 133 (or 142 with ring); 133 (or 142 with ring) miles per hour. Cruising speeds, 100; 112; 112 miles per hour. Landing speeds, 40; 45; 45 miles per hour. Rates of climb, 900; 1,200; 1,200 feet per minute. Service ceilings, 15,000; 18,000; 18,000 feet. Radii, 540; 460; 420 miles. Gasoline capacities, 30 gallons, all three models.

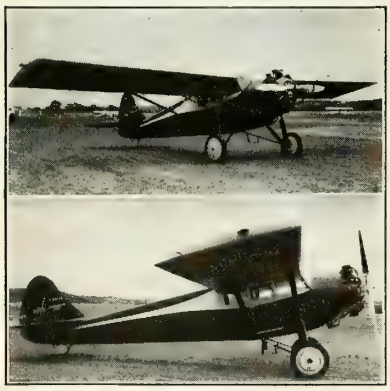
The fuselage of all three models is of welded steel tubing, engine mount being integral with fuselage. Covering is Flightex. Ailerons are unbalanced. Framework of the tail surfaces is of welded steel tubing, braced. Wings are one-piece, conventional two-spar construction. Two persons are accommodated. Landing gear is of the divided type. Equipment includes Hartzell wood or Hamilton-Standard propeller, Aircraft Products brakes, Pioneer instruments, Monoil oildraulic shock struts, Goodrich tires, Townend ring, wheel pants. Model 90 approved for Edo float installation.

Two persons are accommodated. Models 110 carries 33 pounds of baggage; model 125, 29 pounds; and model 90, 52 pounds.



MONO
MONOCOACH 275
Mono Aircraft Corporation
Moline, Illinois

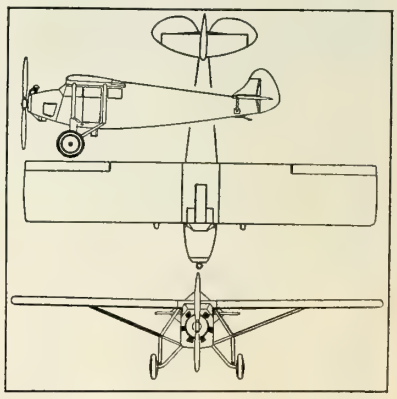
Specifications: Span, 39 feet. Length overall, 26 feet 8 inches. Height overall, 7 feet 8 inches. Wing area (including ailerons), 222 square feet. Wright J-6 of 225 horsepower. Power loading, 14 pounds per horsepower. Wing loading, 14 pounds per square foot. Weight empty, 1,883 pounds. Useful load, 1,217 pounds. Gross weight, 3,100 pounds.



Performance: High speed, 133 miles per hour. Cruising speed, 112 miles per hour. Landing speed, 55 miles per hour. Rate of climb, 1,200 feet per minute. Service ceiling, 18,000 feet. Radius, 350 miles. Gasoline capacity, 63 gallons.

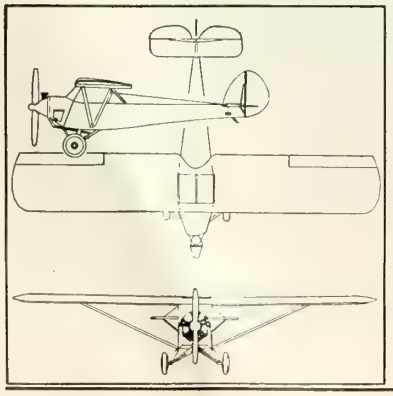
The framework of the fuselage is constructed of welded steel tubing (1025 steel except in highly stressed members which are 4130). The engine mount is integral with the fuselage. Covering is of Flightex. The ailerons are Frise type, wood construction with aluminum leading edge. The framework of the tail surfaces is of welded steel tubing, braced. Stabilizer is adjustable in the air, fin on the ground. The wings are two-piece, conventional two-spar construction. Spars are spruce, ribs picture frame with basswood webs and spruce capstrips. The leading edge is covered with aluminum. The landing gear is the divided type, heat treated 4130 steel tubing.

Propeller is Hamilton-Standard; instruments, Pioneer; shock absorbers, Aircraft Products oildraulic struts; brakes, Bendix. Wheels are 30 inches by 5 inches. Four persons without parachutes and 114 pounds of baggage or 34 pounds of baggage and parachutes are accommodated. Dual controls are provided.



MONO
MONOPREP 218
Mono Aircraft Corporation
Moline, Illinois

Specifications: Span, 32 feet 3 inches. Length overall, 21 feet. Height overall, 6 feet 3 inches. Wing area (including ailerons), 143 square feet. Velie M-5 of 55 horsepower. Wing loading, 9 pounds per square foot. Power loading, 23.4 pounds per horsepower. Weight empty, 783 pounds. Useful load, 505 pounds. Gross weight, 1,288 pounds.

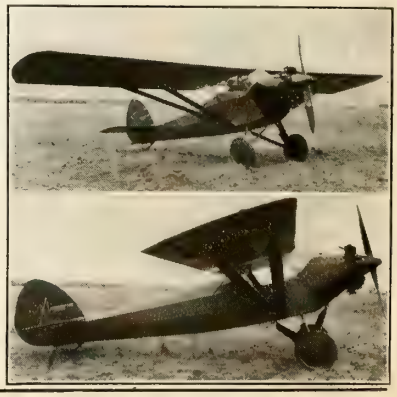


Performance: High speed, 90 miles per hour. Cruising speed, 78 miles per hour. Landing speed, 40 miles per hour. Rate of climb, 600 feet per minute. Services ceiling, 9,000 feet. Radius, 240 miles. Gasoline capacity, 14.6 gallons.

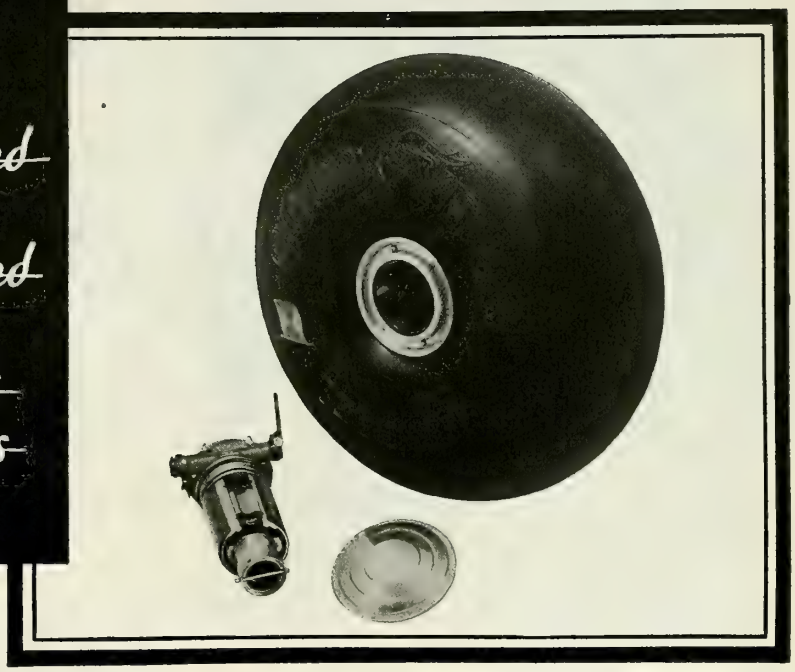
The framework of the fuselage is constructed of welded steel tubing (1025 steel). The engine mount is integral with the fuselage. The covering of the fuselage is Flightex. The ailerons are plywood, unbalanced, inset slightly from the tip. The framework of the tail surfaces is of welded steel tubing, braced. The wing is one piece, conventional two-spar construction. Spars are spruce, ribs picture frame with basswood webs and spruce capstrips. The landing gear is of the divided type, heat treated 4130 steel tubing. Monoil oildraulic shock struts are provided.

The propeller is Hamilton-Standard. Instruments are Consolidated. Tires are 26 inches by 4 inches. Aircraft Products brakes are provided as optional equipment. Shock absorbers are Monoil oildraulic.

The Monoprep accommodates two persons, including crew. Twenty-five pounds of baggage and parachutes are accommodated, or 65 pounds of baggage less parachutes. Seating arrangement is side by side. Controls are dual.



~~Mud~~
~~Sand~~
~~Snow~~
~~Plowed Ground~~
Timber
~~Rolling Ground~~
Fog
~~Cross Winds~~
~~Small Fields~~
Water



Strike out

most of the landing hazards

Less than two years ago, every landing condition on this list meant real risk for the ship and pilot.

Today, you can strike out seven of the ten, if your ship carries Goodyear Airwheels and the new Airwheel roller bearing brake.

These great soft rolling rubber pillows spread out when they touch the ground—and carry you safely through mud, over sand, snow and plowed ground. With Airwheels, you can make downhill or hillside landings—cross-wind or down-wind too.

With Airwheels and Airwheel brakes—you can "stop on a dime." These brakes combine *power, smoothness* and *sure release* in such perfect combination that you can slide the wheels or bring up the tail (depending on landing surface) and still keep complete control.

Think that over, you men who own ships and you men who fly them. Can you afford to be without this protection?

Only Goodyear can give you Airwheel safety. For engineering data, write or wire Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

When you buy a new ship specify Goodyear Airwheels

GOODYEAR

EVERYTHING IN RUBBER FOR THE AIRPLANE

RECENT AIRCRAFT PATENTS

THE following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N. W., Washington, D. C., at the rate of 20c. each. State number of patent and name of inventor when ordering.

Pontoon for aircraft. William J. Von Miller, Seattle, Wash. (1,794,474).

Aircraft control. Paul P. Horni, Newark, N. J. (1,794,690).

Gyroscope turn indicator. Victor I. Zelov, Rosemont, Pa., assignor to Aircraft Control Corporation (1,794,749).

Tail-wheel mount for aeroplanes. Ludwig Reichert, Brooklyn, and Michael Watter, New York, N. Y., assignors to Chance Vought Corporation, Long Island City, N. Y. (1,794,796).

Airplane. William Wait, Jr., Garden City, N. Y., assignor to Chance M. Vought, Grenwolde, Great Neck, N. Y. (1,794,811).

Amphibian aeroplane. Michael Watter, New York, N. Y., assignor to Chance M. Vought, Great Neck, N. Y. (1,794,813).

Aeroplane. Michael Watter, New York, N. Y., assignor to Chance M. Vought, Great Neck, N. Y. (1,794,814).

Aerial advertising and signaling. Louis Bleriot, Paris, France (1,794,828).

Airplane. Albert C. Gienger, Cascade Summit, Ore. (1,794,844).

Float for hydroplanes, flying boats, and the like. Herman Hillmann, Berlin-Friedrichshafen, Germany (1,794,898).

Aeroplane. William P. Rudkin, Oklahoma City, Okla. (1,794,923).

Flying machine. George E. Pellissier, Holyoke, Mass. (1,795,035).

Casing in two parts for packing parachutes. Robert Habermehl, Berlin-Schoneberg, Germany (1,795,168).

Aircraft. Charles S. Hall, Los Angeles Calif. (1,795,334).

Dirigible construction. Charles S. Hall, Los Angeles, Calif. (1,795,335).

Aircraft. Haviland H. Platt, Wallingford, Pa. (1,795,501).

Heating means for airplane wings. Paul W. Mellberg, Detroit, Mich. (1,795,664).

Steering mechanism for aircraft. Guido Wunsch, Berlin-Steglitz, Germany (1,795,694).

Aerofoil for aeroships, control of inclination. Samuel E. Hitt, Elyria, Ohio (1,795,721).

Propeller for aircraft. Lawrence Kaiser, Milwaukee, Wis. (1,795,863).

Starting and stopping device for airplanes. Sven Svenson, Fond du Lac, Wis. (1,795,906).

Adjustable control for aircraft. William Wait, Jr., Garden City, N. Y., assignor to Chance M. Vought, Great Neck, N. Y. (1,795,910).

Wing for aircraft. Adolf Rohrbach, Berlin-Wilmersdorf, Germany, assignor to Rohrbach Patents Corporation (1,795,970).

Collapsible structure as seaplane floats, pontoons, and the like. Nicholas Straussler, London, England (1,795,976).

Airplane wing. William D. Fricke, Le Roy, Ill. (1,796,016).

Aeroplane landing wing. Walter P. Richardson, Tampa, Fla. (1,796,162).

Device for attaching fabric to airplane ribs. Michael N. Matveyeff, Stratford, Conn. (1,796,572).

Automatic control means for aeroplanes. Ludvig M. Norheim, Dearborn, Mich. (1,796,576).

Metallic airplane wing. Otto Hermann. Brooklyn, N. Y. (1,796,654).

Means for landing and launching airplanes and the like. John Schimmel, 3rd, Bryn Mawr, Pa. (1,796,693).

Aircraft. Albin K. Peterson, Los Angeles, Calif., assignor to Joseph Kreutzer Corporation, same place (1,796,765).

Aircraft. Frank A. Howard, Elizabeth, N. J., assignor to Standard Oil Development Co. (1,796,789).

Parachute construction for aeroplanes. Alfonso Fontanarosa and Frank Carino, New York, N. Y. (1,796,838).

Rotifer stabilizing wing. Ora F. Bowers, Los Angeles, Calif., assignor to Aeronautical Devices Incorporated, Ltd. (1,796,860).

Landing and launching mechanism for aircraft. John C. L. Ritter, Jr., Washington, D. C. (1,796,876).

Propeller for aeroplanes. Alexander Bocksruker, Milwaukee, Wis. (1,797,068).

Aeroplane. Richard V. Spencer, Los Angeles, Calif. (1,797,160).

Fastening means for airship envelopes. Karl Arnstein, Paul Helma and Kurt Bauch, Akron, Ohio, assignors to Goodyear-Zeppelin Corporation, same place (1,797,186).

Gas cell construction. Arthur D. Cummings, Portland, Me., assignor to Goodyear Tire & Rubber Co., Akron, Ohio (1,797,189).

Flying wing aeroplane. William W. Christmas, New York, N. Y., assignor to General Development Co., Hartford, Conn. (1,797,326).

Airplane. Alex Jordanoglou, Washington, D. C. (1,797,347).

Aircraft. Charles S. Hall, Los Angeles, Calif. (1,797,502).

Starting device for airplanes. Otto Richter, Kiel, Germany (1,797,514).

Airplane. Randolph F. Hall, Ithaca, N. Y., assignor to Cunningham-Hall Aircraft Corporation, Rochester, N. Y. (1,797,657).

Steering and propelling device for helicopters. Etienne Oehmichen, Valentigney, France (1,797,669).

Aeroplane with detachable body. Guido Brogelli, Los Angeles, Calif. (1,797,713).

Airplane landing and launching apparatus. Richard Gibbons, Brooklyn, N. Y. (1,797,767).

Training device for pilots. Lucien Rougerie, Verseilles, France (1,797,794).

Multiple chamber for taking photographs from aeroplanes. Claus Aschenbrenner, Munich, Germany (1,797,849).

Wing spar. Frank P. Stoneking, Detroit, Mich. (1,798,005).

Aircraft propulsion. Bertha Streichert, Astoria, Ore., assignor to National Aircraft Co., Ltd. (1,798,006).

Aeroplane. Rudolph Chillingworth, Brooklyn, N. Y. (1,798,141).

Rotor flying machine having a plurality of rotors. Ernst Giese, Stettin, Germany (1,798,153).

Rotary flexible propeller. Ugo Antoni, Viareggio, Italy (1,798,299).

Aeroplane and controlling means therefor. Albert E. Henderson, Toronto, Ont., Canada (1,798,325).

Driving mechanism for aeroplanes. Marcel Pillard, Marseilles, France (1,798,628).

Aeroplane. George W. Gardner, Flint, Mich. (1,798,665).

Aeroplane control. Henry B. Chalmers, New York, N. Y. (1,798,724).

Airplane propeller gear. Charles F. Jenkins, Washington, D. C., assignor to C. Francis Jenkins, Inc., same place (1,798,740).

Aircraft landing. Robert R. Roane, Brooklyn, N. Y., assignor to Walsh-Bugbee Co., Trenton, N. J. (1,798,851).

Airplane launching track. Ernst Heinkel, Warnemunde, Germany (1,798,880).

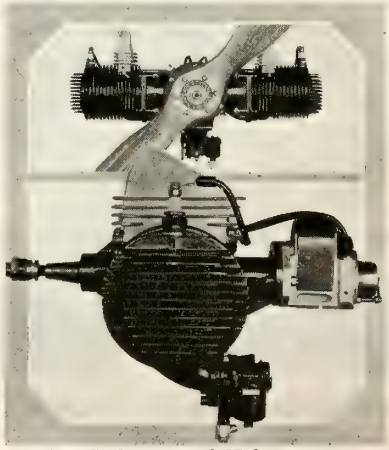
THE CYCLOMOTOR

THE "Cyclomotor," a light aircraft engine designed for installation on light airplanes, has been developed by Cycloplane Company, Ltd., Los Angeles, Calif. This powerplant, a two-stroke engine with two cylinders opposed, develops twenty-seven horsepower at 2,600 revolutions per minute. It is fitted with a Bosch magneto and a propeller hub with puller in hub. All engines are shipped with propellers.

The crankcase and cylinder castings are of aluminum alloy; cylinder sleeves, nickel iron; connecting rods, steel forgings; crankshaft, forged nickel steel; and pistons, alloy. The piston pins are full floating. All bearings are ball and roller.

Specifications

Bore	3⅝ inches
Stroke	3½ inches
Width overall	25 inches
Displacement	72 cubic inches
Compression ratio	5.5 to 1
Fuel consumption (per hours)	2.5 gallons
Weight (less propeller)	55 pounds
Weight of propeller	5 pounds



The Cyclomotor of 27 horsepower

TEXACO

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at

Curtiss-Wright

Flying Service Bases



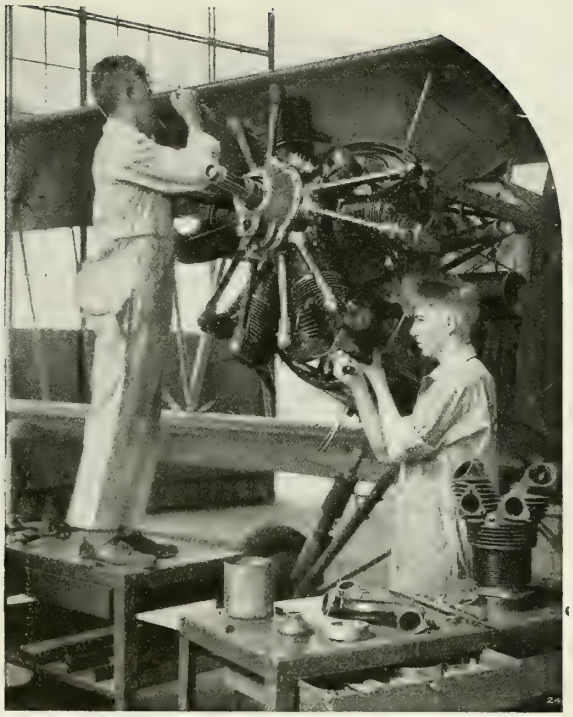
One of six Curtiss-Wright Flying Service hangars at Valley Stream, L. I.



The Curtiss-Wright Flying Service hangar at the Dalworth, Texas, airport



Curtiss-Wright Flying Service planes and hangar at Raleigh, North Carolina



Repair Shop at one of the Curtiss-Wright Flying Service Bases. Texaco Marfak Grease will be applied to rocker arm assemblies.

CURTISS-WRIGHT Flying Service, with 30 important bases throughout the United States, is known everywhere in aviation circles for the exceptionally high type of service and the completeness of its facilities for inspection, repairs and parts replacement.

Texaco Airplane Oils and Texaco Marfak Grease, for the effective lubrication of rocker arm assemblies, are available at all the Curtiss-Wright Flying Service Bases. Texaco Aviation Gasoline is now in distribution at ten of these airports. All Texaco Aviation Products are on the approved list of the Curtiss-Wright Flying Service. Nothing but the highest quality fuel and lubricants could satisfy.

Texaco Lubricants and Texaco Aviation Gasoline are available at all principal airports. Write The Texas Company.

THE TEXAS COMPANY, 135 East 42nd Street, New York

TEXACO AVIATION GASOLINE • TEXACO AIRPLANE OILS
TEXACO MARFAK GREASES

GOODRICH AIRPLANE DE-ICERS

SUCCESSFUL demonstrations of airplane "de-icers," designed to prevent the formation of ice on the surfaces of an airplane in flight, have been completed by the B. F. Goodrich Rubber Company, Akron, Ohio. The apparatus was developed by engineers of the company. After more than eight years' experimentation with many kinds of devices and solutions the problem was solved with rubber and air.

Goodrich has developed rubber coverings containing air tubes which are inflated with compressed air, expanding the surface under the ice crust and cracking the layer into small particles which are easily blown away in the rush of wind as the plane moves at high speed.

American research back of the rubber overshoes was started in 1922. Many liquids were tried in a vain effort to prevent the formation of ice. Different fabrics were used to cover wings, without result.

The Guggenheim foundation assigned the problems to Dr. William C. Geer of Ithaca, N. Y., former head of the Goodrich research laboratories.

Experiments continued until it was found impossible to impregnate the airplane surfaces with any solution that would prevent ice formation, and that an ice-removing device was necessary. Then the rubber covering was devised by Goodrich but it was deemed impractical to experiment with airplanes without first submitting the product to laboratory tests.

Dr. Geer called upon the Goodrich Company for further assistance. C. W. Leguillon, manager of the machine development department, offered to cooperate.

A result of their early conferences was the decision to build a refrigerated wind tunnel in the Goodrich factory where ice formations could be made and where the proposed product could be tested. The Goodrich wind tunnel was constructed in the company's plant in Akron.

In this tunnel it was possible to create a wind velocity in excess of eighty miles per hour and to lower the temperature to zero. An airplane wing section was installed and ice easily formed on its leading edge similar to formations in actual airplane flight.

A small overshoe section was manufactured and stretched over the model wing. Ice was formed on the surface and as compressed air was forced into the tubes of the overshoe and released the eighty-mile gale tossed the small chunks into the air, leaving the overshoe clean. Tests continued in the tunnel chamber until the model shoe was developed.

Wesley L. Smith, chief engineer of National Air Transport, volunteered the use of a mail plane on which to make the initial flight tests. Late last December an N. A. T. mail plane was equipped at Cleveland airport. Smith and Russell Colley, a Goodrich engineer who was active in the work from the beginning of the tunnel, made the first flight, penetrating dangerous clouds. Much ice was encountered and the wing shoes performed their intended task.

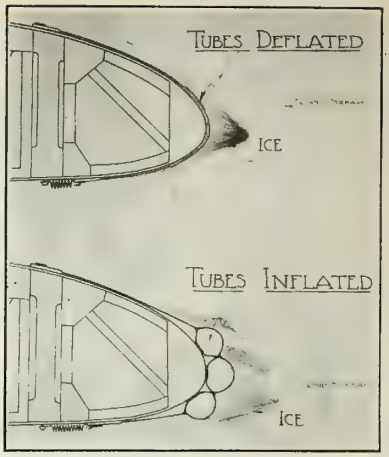
Following solution of the wing problem, the Goodrich group turned its efforts to wire and strut appliances and in a short time had conquered these problems.

Early this year the Goodrich test plane, *Miss Silvertown* was completely equipped with overshoes. Tailored covers were snapped to the wings, other shoes were fastened to struts with zipper fasteners and others were laced on tail surfaces.

First tests were made to determine the effect of the shoes on the airplane's stability. William S. Brock flew the ship and found that there was no noticeable difference in the aerodynamics.

While waiting for ice weather an automatic air compressor was installed on the airplane motor, completing the major developments in connection with the installation.

The next flight test was made at Akron Airport, the *Miss Silvertown* being piloted by Charles Meyers. He circled into the clouds, picked up a layer of ice and successfully eliminated it from all surfaces. On a second flight the coating of ice was retained and brought to earth for ground tests. The tubes were inflated and the rush of air from the ship's propeller carried away the cracked crust.



Installation of Goodrich de-icer on leading edge of airplane wing



Goodrich monoplane *Miss Silvertown* equipped with rubber de-icing devices

FLAT PLATES TESTED UNDER COMPRESSION

TESTS of rectangular flat plates under edge compression are discussed in N. A. C. A. Report 356, by Louis Schuman and Goldie Back. The materials chosen were those suitable for aircraft construction, and the data obtained will be of use in the design of floats, pontoons, wings, etc., of aircraft when the plating is subjected to pressure against the edges.

Plates of duralumin, stainless iron, Monel metal and nickel were tested under loads applied at the two opposite edges and acting in the plane of the plate. Loads were applied until the plates failed to take any more load. The plates were all twenty-four inches long and varied in width from four inches to twenty-four inches; and in thickness from 0.015 to 0.095 inch.

N.A.C.A. BIBLIOGRAPHY OF AERONAUTICS

THE N.A.C.A. Bibliography of Aeronautics for 1929 covers the aeronautical literature published from January 1 to December 31, 1929. The first Bibliography of Aeronautics was published by the Smithsonian Institution as Volume 55 of the Smithsonian Miscellaneous Collections and covered the material published prior to June 30, 1909. Supplementary volumes of the Bibliography of Aeronautics for the subsequent years have been published by the National Advisory Committee.

As in previous volumes, citations of the publications of all nations are included in the languages in which these publications originally appeared. The arrangement is in dictionary form with author and subject entry, and one alphabetical arrangement.

The Bibliography of Aeronautics for 1929 may be obtained direct from the Superintendent of Documents, Government Printing Office, Washington, D. C., at thirty-five cents per copy.





Passengers boarding a Ludington plane



The pilot receives last minute Teletypewriter instructions



The dispatcher signals "All clear" and the plane leaves the ground

ALL TRAFFIC AND OPERATING DETAILS OF THE LUDINGTON LINE ARE INSTANTLY TRANSMITTED BETWEEN AIRPORTS BY

TELETYPEWRITER SERVICE

HOURLY flying schedules of the Ludington Line between New York and Washington call for eight planes in the air at the same time. To operate the line at peak efficiency, Teletypewriters* connect the New York and Washington offices, and the airports at Newark, Camden (Philadelphia), Baltimore and Washington. These are used to transmit all administrative matters, instructions, dispatches, passenger reservations, accounting and auditing reports and, in fact, everything which has to do with operation.

"I don't see how we could operate without the service," says Gene Vidal, Executive Vice-President. "It would be too expensive otherwise. Take just one item: passenger reservations. Teletypewriters enable us to adjust accurately our passenger space out of each city. They mean greater revenue, for we would lose passengers were we not able to work so quickly. And although hundreds of messages are exchanged each day between the connected points, no special operators are required."

Your local Bell Telephone Company will be glad to show you how Teletypewriters can serve *your* business equally well.

* * *

** Teletypewriters are machines resembling ordinary typewriters. They are connected by Bell System wires so that a message typed on one is identically reproduced at the same instant by all other machines on the line.*

AMERICAN TELEPHONE & TELEGRAPH CO. AND ASSOCIATED COMPANIES — BELL SYSTEM

CORNELIUS FRE-WING MONOPLANE

INITIAL test flights of the Cornelius Fre-Wing parasol monoplane were recently made at Glendale, Calif., under the supervision of G. W. Cornelius, inventor, and C. C. Spangenberger, designer. Several unconventional principles of design intended to increase safety and to better general performance are incorporated in the construction of this ship.

The wings are supported by a steel beam structure on a rotation point within the wing, and are controlled from the rear beam through the control tube at the side of the fuselage forward of the rear cockpit.

There are no ailerons; the wings in their entirety are used as ailerons. Small foil sections on outriggers at the trailing edge of the wing panels are the balancing and dampening units which control each wing individually, and are adjustable for various angles of attack from the cockpit through a worm control; they have no connection with the conventional stick control which is provided. It is possible to vary the angle of attack of the wing panels over a means of six degrees by attaining different attitudes of these foil sections. The left section is controlled conjunctionally with the right section and may be adjusted to take care of the torque.

The tail surfaces consist of a fin and a rudder which is conventionally controlled. There are no conventional stabilizers or elevators in the strictest sense of the word.

When the stick control is pushed straight forward, both wings move to a zero-degree angle of attack. The stabilizers, which are fitted to the rear of the fuselage, assume the attitude of positive six-degree incidence, which is adjustable through the control to a positive ten-degree incidence. By pushing the stick back, the wings are brought down to a positive incidence of ten degrees and the stabilizers to a negative incidence of six degrees, (or adjustable to a negative incidence of ten degrees). To acquire the rolling moments of the ailerons of the conventional airplane, the stick is moved across the cockpit as in the conventional type of ship. If the stick is moved from the center position to the extreme right, the right wing will rise three degrees and the left wing will lower three degrees, making a difference of six degrees maximum in the angle of attack in the two wings. This does not affect the stabilizer. This attitude may be attained whether the stick is in the rear of the cockpit or in the maximum forward position or any intermediate point between the two.



On the Cornelius monoplane, the wings operate like ailerons

The plane may be climbed without moving the stick by adjusting the foil sections at the trailing edge of the wing panels so that the angle of attack of the wings is increased. According to the sponsors of the Cornelius plane, the ship will not stall and pulls over into a glide when one is attempted. When the engine is throttled the plane automatically assumes a landing angle and maintains this attitude until the ship lands.

Each assumed attitude of the plane in flight is transferred through the control to the stabilizer and maintains the fuselage in level attitude under normal flying conditions. The plane may be maneuvered in zooms or dives by overcoming the pressure on the stick and holding it in any given attitude. When the stick is released the ship automatically seeks a level flight position.

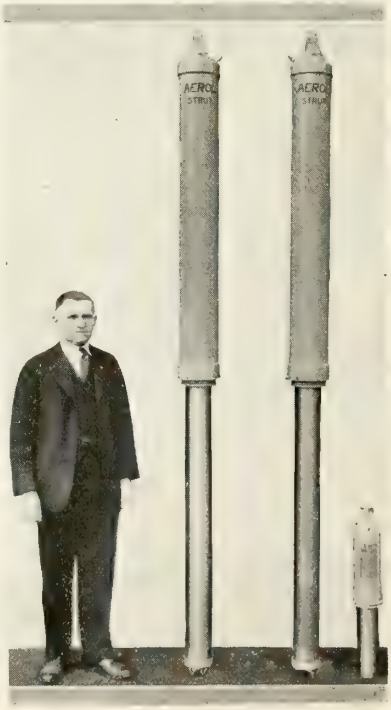
The plane is powered with a Menasco B-4 engine driving a Story all-wood propeller. Standard equipment includes Airwheels and Pioneer instruments.

Specifications

Wing span	30 feet 6 inches
Length overall	20 feet 6 inches
Height overall	7 feet 10 inches
Wing area	146 square feet
Weight empty	1,010 pounds
Weight loaded	1,490 pounds
High speed	110 miles per hour
Cruising speed	95 miles per hour

AEROL STRUTS

AEROL shock-absorbing struts built to support a maximum load of 25,000 pounds have been developed by the Cleveland Pneumatic Tool Company.



Large Aerol struts carry 25,000-lb. load

Each strut weighs 142 pounds, has a seven-inch diameter, an extended length of 113 inches and in flight can be retracted to sixty-four inches, the minimum length. These struts are intended for large transport planes carrying as many as fifty passengers and a strut designed for an ordinary-sized transport ship will be used with them as a tail skid shock absorber.

The smallest struts manufactured by the Cleveland company for light sport planes weigh two pounds each and in flight position are fourteen inches long.

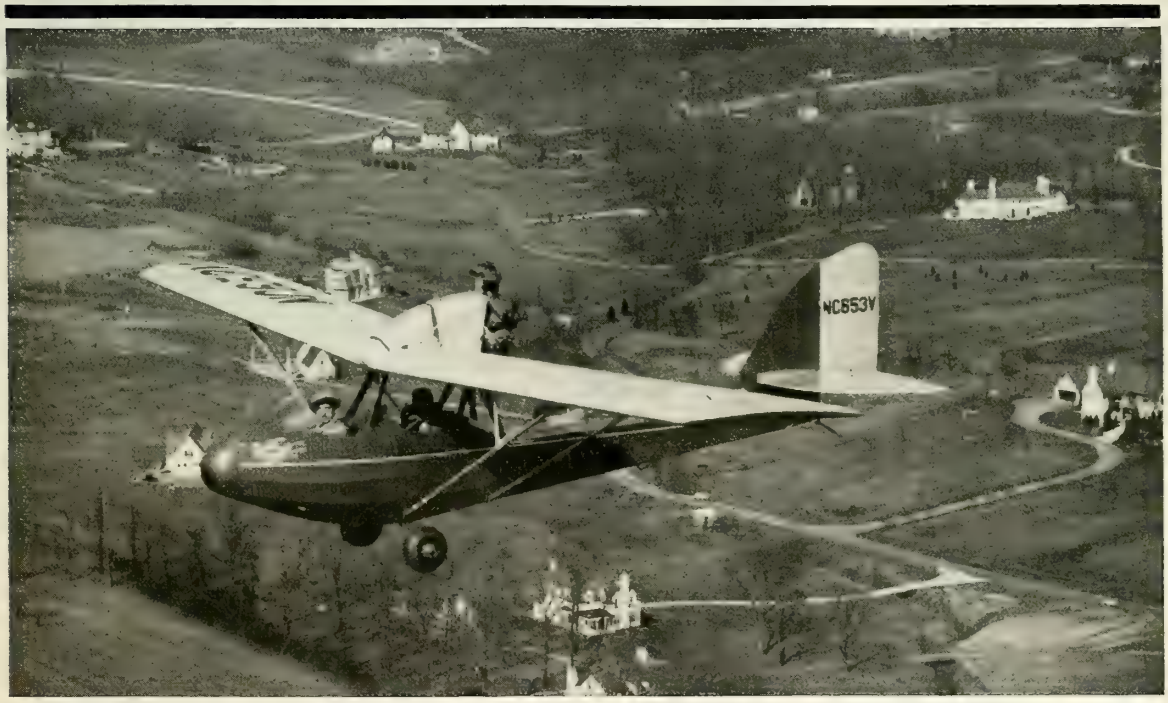
Aerol struts are telescoping cylinders, inflated with air and installed between the axle and fuselage to absorb the shocks of take-off, landing and taxying. A piston and valve mechanism installed within the cylinder absorbs the shock through the use of compressed air and oil.

SAFETY NUTS

TWO types of safety nuts are made by the Safety Nut Corporation, Philadelphia, Pa.—the pin nut type and the brake lock type, designed to withstand vibration without being jarred loose. The pin nut is provided with screws into which can be inserted a key or pin, locking the nut in place at any point on the bolt. The brake lock nut is equipped with a brake that comes into play whenever vibration results in desertion of the grip. These nuts cannot be removed without a wrench.

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CURTISS-WRIGHT

AIRPLANE COMPANY

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DIGEST OF FOREIGN TECHNICAL ARTICLES

AERODYNAMICS

Pressure Distribution on a Ball Surrounded by Air (Druckverteilung an der luftumströmten Kugel), O. Krell. Zeitschrift für Flugtechnik und Motorluftschiffahrt, Vol. 22, No. 4, February 28, 1931, pp. 97-105, 20 figs.

MEASUREMENTS of pressure distribution made on an eight-centimeter ball in a wind tunnel with wind velocities of 6, 12, 20, 30, 40 and 52.5 meters per second are discussed, and reference is made to Prandtl's theory that a thin wire ring attached to the front of the ball considerably diminishes the resistance of the air in the vicinity of the burbling area. The measurements and pressure diagrams show the tremendous influence of the dynamic effect, especially the influence of the centrifugal force of the flowing mass upon the local differences of pressure between the stream and the body surface, and upon the formation of the whole stream.

The opinion that the mean differences of pressures and corresponding camber of the streamlines are negligible is contradicted in the first place by pressure measurements of the ball with the ring, and the deflection which becomes proportionally less with changing the direction of the flow and the form and area of the backwash. Flow and kinetic energy, centrifugal force and burbling, friction and eddy formation, wash and backwash are inseparable. Opposed to the static pressure which lies over the whole stream is the centrifugal force of the stream (the inertia) when it wants to free itself from the convex surface of the body. If it gets through, then the stream separates and forms the vortex filled wash space and back wash, or the cavity, but if the static pressure is the stronger, then the stream remains against the body. The static pressure corresponding to the vacuum presses and draws in the stream in overcoming the centrifugal force against the body.

CORROSION PREVENTION

The Corrosion of Metals and Alloys Used in Aeronautics (La corrosione dei metalli eleghe usati in aeronautica), G. Guzzoni and E. Nardi. "Aerotecnica," Vol. 11, No. 1, January, 1931, pp. 50-77, 5 figs.

THE importance of corrosion prevention in aeronautical construction and the question of corrosion tests which will approximate reality as closely as possible are discussed. In regard to iron and steel corrosion, the theories of rust formation are mentioned and the methods available to preserve iron from oxidation or to diminish corrosion are examined. Some tests of corrosion in synthetic sea water, carried out at the Istituto Scientifico Tecnico E. Breda are described, which show the superiority of cadmiuming over other preservative methods, including zincing.

Experiments made by the authors, which demonstrated that wrought aluminum, especially duralumin, corrodes somewhat, particularly in the presence of internal stresses, riveting, and in contact with other metals, are outlined. Methods of preventing corrosion in these alloys are taken up, including Alclad, Duralplat and Allautal.

By Elsa Gardner

The authors show that the tendency to corrosion depends partly on the composition and structure of the alloy. Their experiments showed that, according to the alloy composition, there are very high differences in liability to corrosion. They conclude that the accurate study of the most appropriate additions and of the best compounds will diminish one of the main obstacles to the use of these alloys.

Paper presented before the Italian Society for the Advancement of the Sciences.

ALTITUDE EFFECTS

Variation of Power with Height, W. G. Jennings. "Aircraft Engineering," Vol. 3, No. 25, March, 1931, pp. 55-56, 2 figs.

THE power factor in relation to international standard atmosphere is discussed and a method for reducing the power factor from aircraft performance is determined. In several examples the author shows how the brake horsepower may be expected to vary with change of atmospheric conditions. The position of the supercharged engine is said to be less satisfactory because no experimental investigation by direct measurement has been made of power which is developed by the supercharged engine at heights.

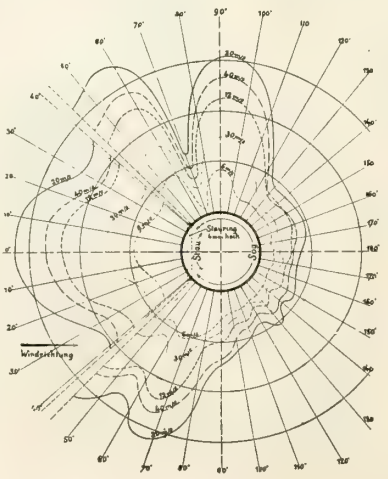
RACING PROPELLERS

Airscrews for High Speed Aeroplanes, H. Glauert. (British) Aeronautical Research Committee, Reports and Memoranda No. 1342 (Ae. 474), June, 1930, 18 pp., 7 figs.

CHARACTERISTICS of a series of high-pitch propellers have been calculated with a few simplifying assumptions, and the results employed to establish a relationship between the pitch-diameter ratio, torque coefficient, and solidity of a propeller operating near the state of maximum efficiency. Another approximate formula has been derived for the efficiency of the propeller, and these formulas used to determine the most suitable type of propeller for a high-speed airplane. A simple formula has also been derived for the static thrust of a high-pitch propeller.

The results suggest that the tip speed of the propeller may be limited to the moderate value of 900 feet per second and that, with a suitable gear ratio, an efficiency of over 80 per cent may be anticipated. For a modern racing plane, the most suitable propeller is one with two blades of 10-ft. diameter. It is necessary to employ a gear ratio of the order of 0.6, but, as the airplane speed increases, the need of a gear ratio will disappear and the most suitable propeller will be one of smaller diameter but with a larger number of blades.

The relatively poor static thrust is an inevitable consequence of the high speed of the airplane and the only hope of improvement lies in the use of a variable-pitch propeller.



Pressure distribution on a ball with a ring

DIESEL ENGINE AND EXHAUST GAS TURBINE

The Power Recovered in the Exhaust of Two-Cycle Diesel Engines (Sur la puissance récupérable dans l'échoppement des, moteurs Diesel à deux temps), P. Dumanois. Comptes Rendus Herbomadaires des Séances de L'Académie des Sciences, No. 4, Jan. 26, 1931, pp. 215-219.

THE author presents briefly a theoretical development showing the maximum power which may be obtained in utilizing the exhaust gases of a two-cycle Diesel engine by means of a variable-pressure gas turbine such as that considered by Rateau. The effective horsepower which may be recovered by using all the energy in the exhaust gases amounts to 0.33 horsepower, while 0.22 horsepower is recovered by utilizing 0.7 of that energy. It is shown that it is thus possible to provide for the scavenging and supercharging by recuperating a part of the energy contained in the exhaust gases.

METAL CONSTRUCTION

Modern Problems in the Construction of Metal Airplanes (Problemi moderni nella costruzione metallica degli aeroplani), G. Gabrielli. "Aerotecnica," Vol. 11, No. 1, January, 1931, pp. 7-49, 41 figs.

FIVE problems found in metal airplane construction are examined. In discussing the resistance of metals to the action of the air and water, and to torsional stresses, the author includes chrome-molybdenum steel tubing, duralumin and Alclad, touching upon methods of preventing corrosion in each. In taking up the properties of joints made by riveting thin sheets of duralumin, the author sets forth special phenomena and illustrates them with photographs of experiments he conducted in the Piaggio factory in Finalmarina and refers to the superiority of nails over rivets for thin sheets.

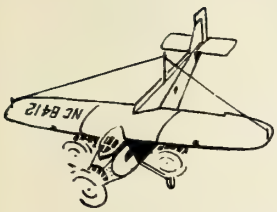
The advantage of the keeled form of seaplane hull in comparison with the flat one in regard to safety are demonstrated, and a method of analyzing the form of the bottom of the hull is described.

The superiority of cantilever wings with smooth sheet covering over the fabric-covered wing is explained and the problem of

(Continued on following page)

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(*Continued from preceding page*)
torsional resistance is considered with illustrations from experiments carried out in the Piaggio factory. The influence of the plane form of the cantilever wing on the structural weight is brought out.

After deriving the law of transposing experimental results from the model to full scale and the Wagner method of representing such experimental results, the author shows the essential characteristics which differentiate aircraft construction from general iron construction.

Paper presented before the Associazione Italianna di Aerotecnica.

TWO-CYCLE DOUBLE-ACTING OIL ENGINE

A New Engine for Aviation (Un nuovo motore di aviazone), M. Behmann. Revista "Aeronautica," Vol. 7, No. 2, February, 1931, pp. 290-294, 8 figs. on supplementary plates.

COMPLETE details of a two-cycle double-acting Diesel engine for aircraft use are given by the inventor. A description of the principle involved and suggestions for its application to both the fuel injection and spark ignition types of engines appeared in the November issue of the magazine and were illustrated and abstracted in the February issue of AERO DIGEST. Inside an ordinary cylinder the movable hollow piston is located and inside this piston, a fixed piston. The area of the cylinder within the movable piston is varied by the motion of the movable piston.

The author realizes his invention in a six-cylinder in-line water-cooled Diesel engine developing 980 horsepower at 1,800 revolutions per minute, and weighing only 640 kg., or 0.65 kg. per horsepower. The bores are 160.5 and 154.75 mm., respectively, and the stroke 156 mm. The compression ratio is 13.1. The author compares the specifications of his engine with those of the Packard, Clerget, Sunbeam, and Junkers heavy-oil engines, and shows assembly and detail drawings of the cylinders, cylinder block, pistons, pump, cooling system and crankshaft for his invention.

WIND TUNNEL TESTING

On the Validity of Large Scale Tests in an Open Jet Wind Tunnel. Tests on One-Fifth Scale Bristol Fighter in 5-Ft. Open Jet Tunnel, W. G. A. Perring and C. Callen. (British) Aeronautical Research Committee, Reports and Memoranda No. 1348 (Ae. 480), July, 1930, 12 pp., 9 figs.

THE possibilities of experiments in an open-jet wind tunnel upon airplanes of wing span greater than the jet diameter were investigated. The measurement of changes in the force along the wind, due to changes in the parts of the airplane situated near the center of the jet was of particular importance.

A one-fifth scale model of a Bristol Fighter was tested in a five-foot open-jet tunnel. Lift and drag without propeller, and with stopped propeller, and lift and net thrust with propeller running, were measured at angles of incidence from -4 to 8 degrees. The results were compared with those for similar tests carried out on the same model in the Duplex tunnel at the National Physical Laboratory at Teddington. In addition, some exploration of the jet was made with the model in position. The tests have demonstrated the possibilities of measuring the changes of drag or thrust, resulting from modifications to parts of the airplane situated near the axis of the jet, even when the airplane span greatly exceeds the jet diameter.

BRITISH AERONAUTICAL RESEARCH

Aeronautical Research in England, R. Glazebrook. "Aircraft Engineering," Vol 3, No. 25, March, 1931, pp. 63-66.

THE purpose and organization of the Aeronautical Research Committee are discussed and a summary is given of the ten years' work under its direction. Achievements in the fields of lateral stability, autorotation and spinning, flutter, airfoil theory, surface layers, turbulent and streamline motion, Professor Jones' transition curves, and flow at speeds approaching that of sound are described. In each case, the author refers to papers already published, dealing with each of these subjects individually.

Paper presented before the International Air Congress.

EMPENNAGE AND PROPELLER INTERFERENCE

Influence of the Empennage and Effects of the Propeller, G. A. G. Andreoli. "Notiziario Tecnica di Aeronautica," Vol. 6, No. 12, December, 1930, pp. 219-234.

THIS is a continuation of two aritcles recently published in the magazine (previously abstracted in AERO DIGEST), with special reference to the one regarding a wing subject to a non-uniform current. The mutual influence between wing and empennage, and between propeller and airplane, is discussed.

The angle of downwash in the field of the velocity produced by the vortices (bound and free), and a certain zone of irregular action of the empennage which is present when it falls in the slipstream of the vortices of Karman due to the wing, are considered.

It is concluded that, for equal incidence, the resultant new lift owing to the action of the propeller upon the wing is obtained by multiplying the original lift by a corrective factor and adding a constant term which is the function of the mounting. The corrective factor differs from unity proportionally to the relative regression. The effect of the propeller does not vary. the induced drag, if it is limited to terms of the first order, provided the angle of the one quantity increases proportionally to the angle of mounting.

FLIGHT TEST

Full Scale Determinations of the Motions, at Stall, of a Bristol Fighter Airplane with Slot and Aileron Control on Both Planes, K. W. Clark (British) Aeronautical Research Committee—Reports and Memoranda No. 1341, (Ae. 473), May, 1930, 7 pp., 21 figs.

FURTHER tests are described of the behavior of an airplane at large angles of incidence when certain controls are applied. A Bristol Fighter fitted with slot and aileron control on the top and bottom planes was employed. The motions of the plane, together with the angles of incidence and sideslip, and the movements of the controls, when certain controls were applied at two initial incidences, were recorded photographically.

It was found that below and above the stall the lateral control produced a rolling moment of the right sign, but above the stall it is not always powerful enough to reverse angles of bank over 60 degrees. A considerable amount of yaw resulted from any attempt to reverse the rate of roll beyond the stall. The rudder appeared to lose no power at the stall and was effective in reversing the rate of roll and yaw at both incidences.

FUSELAGE RADIATORS

Drag and Cooling Effect of an Airplane Fuselage with Various Arrangements of Radiators (Widerstand und Kühlwirking eines Flugzeugrumpfes mit verschieden angeordnetem Kühler), H. Muttray, "Zeitschrift für Flugtechnik und Motorluftschiffahrt," Vol. 22, No. 2, February 14, 1931, pp. 65-71, 20 figs.

THE question of the most favorable position for the radiators of water-cooled engines is taken up from the standpoint of the construction of the airplane. The choice of radiator, where it should be placed in the plane, and how it may be designed to perform the necessary cooling with the least harmful drag are briefly discussed. The article deals mainly with results of wind tunnel tests of a fuselage with radiators but without wings or propeller. The influence of the radiator inlet cowling and the effects of varying the size of the air outlet slot above the motors, and of varying the radiator pressure-drop coefficient are shown.

HEAVY-OIL ENGINES

Compression Ignition Engines, D. R. Pye. "Aircraft Engineering," Vol. 3, Nos. 24 and 25, February and March, 1931, pp. 35-38 and 70-72, 14 figs.

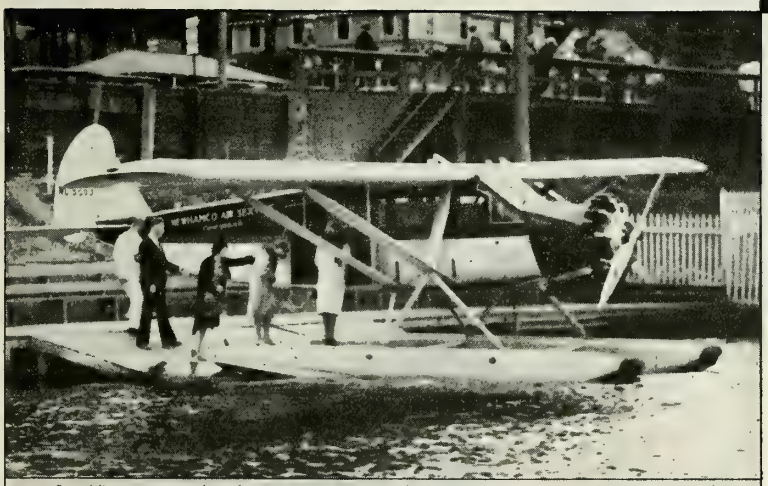
THE history of the development of heavy-oil engines for aircraft is outlined with a section devoted to probable future trends. Three methods of mixing air and fuel to obtain complete combustion are illustrated diagrammatically and their relative advantages are discussed. Research work performed on single cylinders with directed fuel spray, with pre-combustion chambers, and with an organized air swirl is described with special reference to the work carried out by Ricardo for the British Air Ministry.

Details of the two lines of advance being pursued by the Air Ministry are given, the first employing the directed spray and the second the sleeve valve and organized air swirl. In each case, the engine being built is a 12-cylinder water-cooled V following lines of a well-tried gasoline engine. Basing the design upon single-cylinder work using directed spray, the Ministry staff has been responsible for designing the special cylinders, pistons, and other gear necessary for converting a Condor engine to work on the compression-ignition principle. This work has been carried on with the coöperation of Rolls-Royce. The design of the sleeve-valve engine is based on the Rolls-Royce F type engine.

The two-stroke radial engine and the possibilities of supercharging are briefly discussed.

Paper awarded the First Akroyd-Stuart Memorial Prize.

(*Continued on page* 112)



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Fogg's Navy at Lake Winnipesaukee. Robert S. Fogg (at left)

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THE FLOAT MAKERS

PROGRESS IN THE SOUNDPROOFING OF CABIN PLANES

RECOGNIZING the important part the comfort and convenience of passengers always will play in the development of air transportation, the Aeronautics Branch of the Department of Commerce more than two years ago sponsored a program of experiments in soundproofing of airplane cabins, one major phase of which is virtually completed. The results obtained from the completed portion of the tests clearly point to the possibility of reducing the noises in aircraft cabins to the level of those found in railway passenger cars or even lower.

The experiments, conducted by the Bureau of Standards, were divided into two principal parts, one dealing with the reduction of noises at their source, particularly the propeller and engine exhausts, and the other with the reduction of noises that find their way into the aircraft cabins.

The former line of experiment has still much before it, but the latter has already reached practical results, for the sound engineers have found several combinations of materials that possess the three prime characteristics for airplane cabin insulation: (1) The quality of shutting out sound, (2) the quality of absorbing sound, and (3) lightness of weight.

This article is confined to the subject of materials tested for possible use of insulators in aircraft cabins, their method of installation and their suitability.

Sound Measurement Unit

The sound-reducing qualities of the various materials experimented with are expressed in "decibels," which are units of sound measurement employed by acoustical and telephone engineers. The decibel is a term which, if properly used, will give a relation of loudness between two physical intensities.

An ear-sensation scale has been developed which serves as an easy method of comparing the loudness of noises familiar to most people. This scale ranges from the "threshold of audibility" at zero to the "threshold of feeling" which is set forth at 108 decibels. In this range, starting with 10 decibels, there is the sound comparable to the rustle of leaves in a gentle breeze; at 20 decibels an average whisper four feet away; between 35 and 65 the range of speech as usually heard in conversation; the noise found in riding in a train is placed at 65 decibels; noise in stenographic room, 70 decibels; noise in an open cockpit airplane between 90 and 100 decibels.

If the noise in an airplane could be reduced by properly insulating the cabin walls to a level somewhat below the upper limit of 65 decibels for normal speech, it would be fairly easy to carry on a conversation within the cabin and the degree of quietness would be satisfactory. This noise level would be about the same as in a Pullman car when in motion, which means that a reduction in loudness of 35 to 40 decibels is to be produced by the airplane cabin walls.

It is toward this goal that all efforts have been bent, and the results accomplished both in the laboratory and in planes in flight indicate that the objective is clearly in sight, if not actually attained. Absolute silence within the cabin of an airplane is possible of accomplishment, but the weight of the cabin walls would be prohibitive.

Additional Tests

The laboratory experimental tests on sound installation have been conducted in the sound chamber at the Bureau of Standards. This laboratory has specialized in sound-transmission measurements for a number of years, particularly with sound insulation in building construction. The same general method of measurements was employed in testing the lighter airplane materials.

The insulative properties of simple homogeneous materials such as metal sheets and fiber boards were measured, as well as compound structures built up in successive layers. With but one exception, these test panels were of a size 25 by 43½ inches, comparable to the largest area inclosed by the structural members of the cabin fuselage. The panels were tested for the frequency bands 150-180, 400-440, and 1,000-1,093 cycles per second. The results are usually expressed for the average of these frequency bands.

Good sound insulation was gained only by adding a filling material between the exterior and interior finishes, as the existence of air space between the two in the case of light materials is very detrimental, although this is not true in the case of heavier material such as masonry walls. Substances such as hair felt, Balsam Wool, Dry-Zero blanket and cotton were tried as fillers or padding. It was found that the decrease in transmission was nearly the same for all the fillers. However, for the same degree of insulation and volume of space filled, 3 times the weight of Balsam Wool and 6 or 7 times the weight of hair felt is necessary to equal Dry Zero. This bears particular attention since excess weight is a very important factor. Dry Zero is a kapok fiber, very fluffy and resilient in nature. For airplane work it comes in blanket form bound up with cheese cloth. The two-inch thickness weighs about 0.20 pound per square foot.

Type of Padding

Using Dry Zero as a padding material, the tests show an increase of approximately 10 decibels over an air space combination for all of the combination panels tested. This difference of 10 decibels between a padded cabin wall and the more common construction of a dead-air space makes either for a comparatively quiet cabin or a noisy one. The heavier the outside covering, the greater will be the sound reduction; thus an aluminum or duralumin finish would give better sound insulation than fabric. For example, a panel of 0.025-inch aluminum, two-inch layer of Dry Zero, and 3/64-inch micarta gave a reduction factor of 28 decibels and weighed 0.77 pound per square foot. Fabric substituted for the aluminum tested 21 decibels and weighed 0.52 pound per square foot.

A number of materials could be used as sound absorbents, but Dry-Zero blanket appears to be the most efficient for airplane construction because of its lightness in weight. Obviously the material must be covered with a porous cloth or perforated metal sheets to offer a protective surface and still allow sound to filter through and be absorbed. This additional effort is worthy of consideration since a decrease of a few decibels in the noise level often means the difference between a disagreeable noise and one which is tolerable.

An experiment for quieting the cabin on a Navy Ford transport plane has been conducted by the Bureau of Standards. Next to the corrugated metal outside finish and between the structural members, a two-inch layer of Dry Zero blanket was placed. The interior was then finished off with .25-inch fiber board and an additional layer of Dry Zero was added giving a wall thickness of about four inches. The whole interior then was finished off with perforated aluminum sheets of very light weight. The total weight of the cabin wall, including the outside finish, was approximately 1.25 pounds per square foot. The floor was left untreated. It was necessary to cover the windows, as the glass was too thin to be equivalent to the insulating walls.

With this installation the outcome of the tests was surprising. The measurements showed a reduction of 38 decibels, which is an excellent result. To the observers the residual sound seemed to come up through the floor. Whether this was the result of vibrations transmitted by the engines along the framework or to air-borne noises was not certain. Conversation was easily carried on in ordinary tones with the speaker and listener eight feet apart. This could not be carried to greater distances because of space restrictions.

The method of making the field tests is by means of an acoustimeter, which consists essentially of a microphone pick-up, a resistance network calibrated in decibels, an audio amplifier, and a vacuum tube voltmeter. Measurements are made visually, and the difference in noise level or the reduction in loudness imparted by the cabin walls can readily be measured by reading the calibrated network. The instruments weigh about 60 pounds and are portable.

The importance of properly constructed walls is emphasized if efficient sound insulation is to be gained with a minimum of weight. Very little advantage results by simply using a heavy outside or inside finish, a composite structure being necessary. The walls must be padded. Dead-air spaces between the outer and interior finishes are very detrimental from the standpoint of reducing the noise within the cabin. The interior surface should be porous to allow sound to

(Continued on following page)

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Yards of Satisfaction

(*Continued from preceding page*)
be absorbed by the padding in the cabin walls.

Glass for Windows

Inasmuch as the windows are not so effective as the walls, it is necessary to use rather heavy glass and thicknesses of 3/16-inch or ¼-inch are recommended. To keep down the overall weight of the cabin walls, the windows must necessarily be relatively small in area. The experiments show that good sound insulation is possible if proper precautions are taken. Excellent results can be attained with cabin walls ranging in weight between one-half to one pound per square foot. It is doubtful if airplane cabins can be constructed to give a greater decrease in loudness than about 40 decibels unless a prohibitively heavy construction is used. To reach lower noise levels within the cabin, it will be necessary to reduce the noise of the engines and propellers.

Phenomenon of Absorption

The method of padding the cabin walls with Dry Zero has been tried by several aircraft companies and has given satisfactory results. Several planes tested showed even better results than the laboratory measurements would indicate. The explanation for this lies in the fact that the interior finish of these cabin planes was a coarse woven cloth. Besides giving an artistic touch to the interior, the cloth acts as a protective coating to the Dry Zero blanket filling the spaces in the cabin wall between the structural members. Being of a porous nature, the cloth allows sound to filter through from the cabin interior to be absorbed by the Dry Zero.

A small inclosed space such as an airplane cabin is very resonant and has a "drummy" sound if finished off with wooden paneling, micarta, metal sheeting, or any of the other common materials used for this purpose. Instead, the cabin should sound "dead" to the ear. This effect can be obtained by lining the interior with a very absorbent material. It is possible to lower the noise level by 8 or 10 decibels simply by taking these precautions with the interior finish.

Sound Tests on Curtiss Condor

Recently, sound transmission measurements of cabin planes were conducted on the Curtiss Condor No. 4 and the Curtiss Kingbird No. 2 at Roosevelt Field by a representative of the sound section of the bureau in coöperation with the Curtiss Aeroplane and Motor Company. The measurements in both planes showed very satisfactory results in the attempt to insulate the walls against engine and propellér noises.

The instruments and methods used to make such tests are rather simple in nature. By measuring the intensity of the noise just outside of the cabin and again within the cabin a ratio of these two intensities can be expressed as a reduction factor for the walls. The method of measurement is simply to place the pick-up device outside of the windows and in different parts of the cabin interior. At a definite point on the calibrated network a certain deflection is noted on the meter. The interior of the cabin is explored in its different parts, and a different setting of the network is necessary to give the same meter deflection as before. From the calibration of the network it is easy to read off in decibels the amount the noise was reduced by the cabin walls.

Different parts of the interior of a cabin, especially if it is large, will give different degrees of loudness. This is noted also at different window positions. To state the general insulative qualities of a cabin these have to be averaged out. It is well to note these variations as often secondary sources of sounds within the cabin are found in this manner and can later be remedied. In handling the pick-up device, care must be taken that it receives no vibrations from parts of the plane. It is best to hold it in one hand, keeping the arm free from the plane structure.

The propellers on the Condor are three-bladed, 13 feet in diameter, and geared down to 1,200 revolutions per minute. This slow speed helps considerably in reducing the propeller noises. The engine exhausts are brought out through six-foot pipes of four inches diameter and closed off to a point. Small slots opening at the side near the end of the pipes allow the gases to escape.

The main cabin is about 28 feet in length, 6.5 feet in width, and 6.5 feet high. The pilot's compartment is ahead of the main cabin. The entire exterior top is covered with 0.032-inch aluminum-coated duralumin. The sides are of fabric and the underside is covered partially with 0.04-inch aluminum-coated duralumin and partially with fabric. The interior finish covering the ceiling and area above the windows is of several kinds of coarse-woven cloth resembling fine burlap. Below the windows there is micarta paneling about 2.5 feet in height. The chairs and seats are leather covered and padded with felt. Between the interior and exterior finishes is a 1.5-inch layer of Dry Zero blanket fastened between the structural members with small furring strips. No Dry Zero blanket is used under the floor. There are 14 outside windows in the main cabin of 3/16-inch triplex glass, 13 by 22 inches, firmly fastened in place.

Decrease in Sound

The cabin of the Condor showed a general decrease in sound level of about 32 decibels. Generally speaking, this is a reduction in the loudness of sound as heard in an open cockpit plane to a level of that in a railway coach in motion. Speaking could be carried on in ordinary conversational tones with good intelligibility up to a distance of seven feet.

The noise level changed to some extent in different parts of the cabin. Very near the floor or windows the noise level was greater; also near the micarta paneling below the windows it was considerably louder. As these panels were in a state of rather excessive vibration, this must account for the increase of noise in these regions. The pilot's compartment was especially quiet, no doubt because the heavy triplex glass and the metal covering, and also because of its position in front of the propellers and motors.

Several suggestions might be added in the light of further improvements. As stated before, the micarta panels below the windows vibrated excessively. These panels are a secondary source of sound and, if properly dampened, should decrease the noise level. An additional thickness of Dry Zero behind them would possibly dampen their vibration. Further improvements can probably be gained by additional weight to the wall structure; that is, by having the whole exterior covering of metal.

Tests on Curtiss Kingbird

The Curtiss Kingbird No. 2, a six-passenger cabin plane, is powered with two 250-horsepower radial engines suspended to the sides of the fuselage, which position helps to some extent in reducing vibrations transmitted to the cabin. The exhausts are fed to a collector ring and terminated by a short exhaust pipe. The exterior covering is of fabric. The interior finish above the windows and on the ceiling is of a porous cloth. Leather covers the surface between the windows and floor. The walls and ceiling are padded with 1.25-inch Dry Zero blanket. None is used on the floor. The windows are of 3/16-inch triplex glass and relatively small in size. No partition separates the pilot from the passengers' cabin.

This plane showed an average reduction of about 28 decibels. This is much better than laboratory measurements on a similar wall construction and is probably the result of the absorption of sound by the Dry Zero in the rear of the cloth finish. The heavier type glass windows also aid in reducing the noise level. Distances at which conversation could be carried on in ordinary tones was approximately three to four feet.



Insulation material being installed in the Curtiss Condor

24,976,772 Passenger Air Miles by 72,184 Passengers

Over Air Routes Originating or Terminating in Los Angeles

A 12-months record of Three Air Transport Companies

An Attractive Market For Air-craft Factories Located Here



LOS ANGELES COUNTY is one of the most important air transportation centers in America. Six air transport companies maintain base operations here. Conditions for year-round flying are better here. Fliers prefer to fly here. There are more registered pilots, more airports, more licensed air-craft and more skilled air-craft mechanics here. The market for everything pertaining to aviation is here. Air-Craft production centers here.

LOS ANGELES COUNTY

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Manufacturers interested in detailed information regarding the advantages of manufacturing here for the aviation industry are invited to communicate with Industrial Department, Los Angeles Chamber of Commerce.

DIGEST OF A. S. M. E. TECHNICAL PAPERS

A Symposium of Some of the Papers to be Presented at the Fifth National Technical Aeronautical Meeting, Baltimore, Md., May 12-14

By ELSA GARDNER

THE VALUE OF THE TWO-CYCLE ENGINE

Two-Cycle Aircraft Engine, J. H. Geisse.

THE value of the two-cycle engine for the small privately owned plane is discussed with regard to low cost, low percentage of operating time, and the fact that the engine would not be called upon to run at widely varying speeds or under widely varying loads. The author quotes Mr. Ricardo's requirements of a service for which the crankcase-scavenged two-cycle engine would be suitable and demonstrates how they are fulfilled in such a plane. He points out that it is possible to increase the power output per cubic inch approximately 50 per cent at the same speed and that higher speeds may also be obtained by adopting the two-stroke cycle.

He refers to some engines of this type which have been constructed and operated with mean effective pressure of 100 pounds per square inch and to some which his own experiments have demonstrated to possess good idling characteristics and to be free of starting problems. He shows that in addition to the possibilities of weight decrease by increase in power per cubic inch of displacement, there is a possibility of further decrease in specific weight due to better utilization of metal, and that, despite higher specific fuel consumption, the two-cycle may excel the four-cycle engine in payload miles per gallon.

Six designs of two-cycle engines now in the course of development but not yet submitted to the Department of Commerce for approval are described.

BRITISH OIL ENGINE DEVELOPMENT

Development of the High-Speed Oil Engine in England, Alan E. L. Chorlton.

THE origin and development of the high-speed injection-type of oil engine in England from the beginning of the World War to the launching of the R-101 are traced. The Vickers engine employed as standard for British submarines, the original Akroyd engine and the early Ruston design are described. Problems of combustion, injection, injection pumps, and spray valves, which confronted the British Air Ministry and the author in the development of the oil engine for aircraft are discussed with their solutions. Specifications and difficulties in the construction of the engines for the R-101 are given.

The combustion and injection were based on the experience obtained during the development of the Lincolnshire oil engine. The author feels that in the wide-reaching research work carried out on high-speed oil engines, notably in the United States, a more direct connection should be established with actual practice. He thinks the question of turbulence hardly yet properly classified in its various forms and degrees and in relation to the jets. He concludes that the next step will be to extend the flexibility of this motor to allow a wider speed range so that it may run at much higher speeds, in which the forced turbulence of the Akroyd Stuart neck will play its part; and at low ones, whereby a controlled change may do the same.

ENGINE TESTING LABORATORIES

Aircraft Engine Testing and Testing Laboratories, Ralph N. DuBois.

THE experimental laboratories of the Continental Aircraft Engine Company, which were designed and built in 1929 to include facilities for production testing, development work and fundamental research on advanced designs, are described. Details of the five production and endurance testing rooms, air-cooled dynamometer and single-cylinder research rooms are given. A water flotation system is used for supplying fuel to the engines and double flowmeters give continuous indication of the fuel flow to each stand.

To provide further facilities for water-cooled engine research, two of the eight propeller test rooms were combined and 300-horsepower dynamometers placed between two test blocks. The various methods of measuring fuel are outlined and the constant head orifice type flowmeter for use on test stands are shown. The Farnboro indicator is considered very useful in studying the combustion process and indispensible in Diesel work.

Special test apparatus developed by the staff for laboratory and flight testing is described and the effect of atmospheric conditions on test results discussed.

TRAINING NAVAL AVIATORS

The Aviation Course at the Naval Academy, D. C. Ramsey.

BEFORE outlining the scope of aviation training, which now forms a part of the Naval Academy curriculum, the author points out certain phases of past aviation activities and developments in the naval service in order to give a clearly defined picture of the circumstances which have led to the existing policies. He lists as the two fundamental principles in the presentation of aviation subjects at the Academy, that naval aviation shall remain, in all respects, an integral part of the service, and that the primary mission of naval aviation is to support, extend and supplement the operations of the surface forces of the fleet.

The actual time spent by midshipmen with the flight-training squadron is a very small percentage of the total time they are called upon to devote to aviation subjects. These include bombing and aviation gunnery, aviation engines, test stand and engine overhaul, aircraft structures and rigging theoretical aircraft construction, aerology and aircraft tactics, aerial navigation and theory of flight.

ENGINE DESIGNING

Analysis of Aircraft Engine Design, Harold Caminez.

THE value of an engineering analysis in aircraft engine design, including load and stress calculations, is emphasized with a few examples. The author points out that an analysis of the dynamic balance and cyclic torque variation of the engine would be of equal value to the airplane constructor in enabling him to design the airplane-engine mount and propeller to minimize the deleterious effects of these cyclic forces.

The author expresses surprise that the Department of Commerce does not consider the cyclic torsional fluctuations of the engines on which a propeller is to be used, in determining the strength requirements of a propeller and the suitability of the propeller design. The procedure and analysis followed by the author in the development of an engine design are given in detail.

CONTROLLABLE-PITCH PROPELLERS

Value of Controllable-Pitch Propellers to the Aeronautics Industry, W. B. Heinz.

THE elemental scheme of propeller operation is first discussed from the standpoint of the blade-element theory, and the effects of operating conditions upon propeller performance and efficiency are pointed out. The aerodynamic and performance effects of changing pitch are taken up. The improvements in performance with a controllable-pitch propeller are said to result from improved efficiency of both engine and propeller, showing up in shorter and more rapid take-off, steeper and faster rates of climb, better cruising speed with the same engine r.p.m., higher top speed, particularly at altitudes, definite increases in both service and maximum ceiling, and a general improvement in operating economy. Figures are quoted to show the decrease in the operating expenses of transport planes with controllable-pitch propellers.

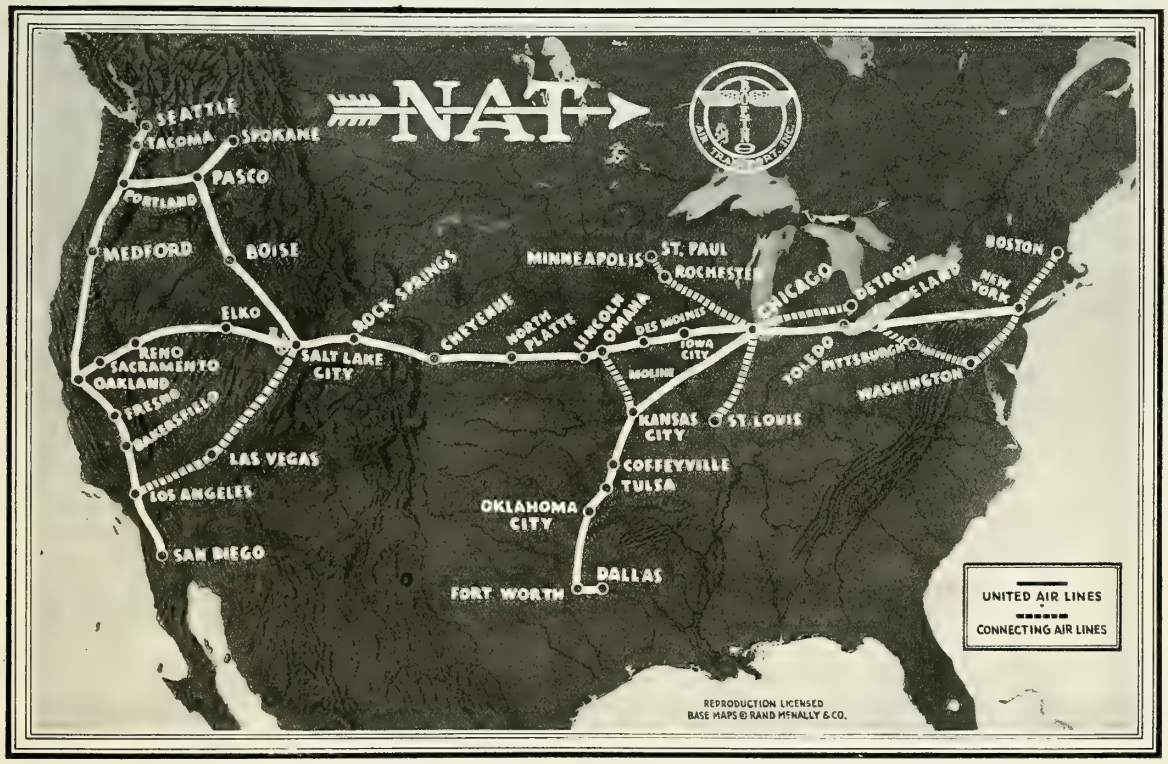
S-ROTOR APPLICATIONS

The S-Rotor and Its Applications, S. J. Savonius.

EXPERIMENTS carried out by the author in the development of the S-rotor, both in the wind tunnel and in the air are described. The S-rotor is a two-vane power wheel of S-shaped cross-section which rotates in wind or water. The results of comparative power tests with a 12-vaned steel windmill and a 4-vaned La Cour mill, which show the superiority of the S-rotor, are outlined. The author refers to various applications of the S-rotor, including aero-

(Continued on following page)

28 HOURS FROM SAN FRANCISCO TO NEW YORK



With STANAVO the planes of N. A. T. and Boeing span the continent daily

Leave San Francisco in a Boeing Air Transport plane at noon-time, change to a National Air Transport plane at Chicago the following noon, arrive in New York in time for the theatre that night. Just twenty-eight hours of night and day flying—and the return trip is made in thirty-one hours.

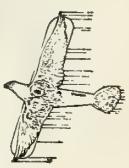
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Boeing—flying the most hazardous and difficult part of the trip—has adopted Stanavo Aviation Gasoline for exclusive use in all of its planes. Every engine on every N. A. T. and Boeing plane flying the coast-to-coast route is lubricated with Stanavo Aviation Engine Oil.

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26 Broadway, New York City

(*Continued from preceding page*)
turbines for pumping work and the generation of electricity; pressure and exhaust fans; moving advertising signs; stream recording in air and water; driving gyros and compressors on airplanes; water motors in river and tidal flow, and wave motors. He considers the S-rotor the first machine which has been able to turn wave action into a unidirectional rotary movement for power purposes. A power output of from 1.8 to 2.7 horsepower per square meter is said to be obtainable with a wave speed of about three meters per second.

AVIATION TRAINING

Vocational Training in Aviation, Frank Cushman.

THE author, who is Chief of the Industrial Education Service, Federal Board for Vocational Education, presents the present status of training programs for airplane and aircraft engine mechanics in public and private schools. He discusses the characteristics of efficient vocational training and the standards which should be considered with reference to the further growth, improvement and development of the aviation training program. He criticizes the tendency to insert into the courses for airplane and engine mechanics subject matter of little actual value to them, such as history of aeronautics, and the calculation of horsepower, wing curves and other items not needed by the shop man.

AERODYNAMICS

Decrease of Disturbed Motion in the Flight of an Airplane, Louis Breguet.

THE author describes the means employed on road vehicles and ships to eliminate, or dampen, the parasite motions caused by sudden or systematic disturbances of the surrounding or adjacent medium, such as the roadway and sea waves, and compares them with those which must be used on airplanes to counteract the effects of sudden disturbances in the air around the airplane in flight. He analyzes the ordinary motions of the airplane and those due to the sudden disturbances of the air; the vertical and pitching oscillations so disagreeable to the airplane passenger. He explains how these oscillations may be suppressed by means of automatically controlled slots located at the rear of the wing and the horizontal tail surfaces.

LIGHT PLANE DESIGN

Design and Possibilities of the Light Plane, I. H. Reisner.

IN discussing the basic design considerations for the new light airplane, the author refers to the influence of the glider upon the popularity and design of the light airplane. He is of the opinion that a new version of the light airplane is at hand and that, while it is desirable to keep the appearance of the light plane somewhat like the conventional higher powered plane, it is also worthwhile to incorporate design features of the soaring plane. He considers the high-wing, strut-braced monoplane best for this type, due to its simplicity, moderate manufacturing cost, low unit weight, and ease of repair and maintenance in the hands of untrained operators. Service and power loadings, slow landing speeds, folding wings, low-pressure tires and improvements in structural design are also taken up.

The author believes that the low-power plane should be considered as a help to rather than competitor of, the medium-power plane, and that it has a definite possibility of meeting and developing the private-owner market on a sound basis while creating also new markets for other classes of aircraft.

TRANSPORT PLANE DESIGN

Comparison of Airplane Types from the Transport Standpoint, F. T. Courtney.

THE general and detail requirements of an efficient transport plane are considered with a discussion of how the various types may fulfill these necessities. In taking up the cantilever monoplane, straightforward biplane, externally-braced monoplane and biplane variations, the author criticizes the tendency in American transport to regard the biplane as a cross between Cinderella and an obsolete maiden aunt when, in his opinion, all evidence goes to show that the requirements of today lead to the biplane. He points out the disadvantages of the metal wing, the flying wing, the cantilever monoplane, the single-motored plane and the air-cooled engine for the transport service, in spite of the trend towards these designs.

RADIO FOR FOG FLYING

A System for Flying and Landing Aircraft in Fog, H. Diamond and F. W. Dunmore.

A RADIO system of blind landing aids, developed by the Aeronautics Research Division of the Department of Commerce at the National Bureau of Standards, is described. The results already obtained with this system indicate that it will soon be ready for use under the severe conditions encountered in commercial air transportation. The system has been developed to be adaptable for use in conjunction with the radio navigational aids already being provided for point-to-point flying on the civil airways of the United States. For this reason it requires a minimum of additional equipment both on the ground and on the airplane.

SPINNING CHARACTERISTICS OF AIRCRAFT

Tail Spinning of Aircraft, G. G. Budwig.

THE experience of the Department of Commerce in the approval of new types of aircraft, as far as light characteristics are concerned, is discussed with special reference to tail spins. The procedure followed in determining whether or not the spinning characteristics are satisfactory is outlined and the corrective measures taken when they are undesirable, are described.

The Department of Commerce determined that the four factors which in most cases will determine if an airplane will have satisfactory spinning characteristics are: It should be stable about all three axes; the center of gravity should be well forward with respect to the center of pressure; the wing loading should be kept below a certain maximum figure, depending mostly upon the characteristic of the particular airfoil; the weights of airplane and cargo should be grouped as closely as possible around the center of gravity.

AIRCRAFT WELDING

The Cause and Prevention of Heat Cracks in Aircraft Welding, H. S. George.

PRECAUTIONS to be observed in welding aircraft in order to prevent cracking are discussed with results of a study of the forces encountered in welding. The author considers that contraction is the chief cause of heat cracks, and concludes that their prevention is not difficult at the most. It is greatly simplified by the fact that practically all cracks fall into two main groups: the edge crack, which predominates, and the crack caused by some internally stressed condition of the metal. A simple expedient suffices to prevent each type of crack, that is, for the edge crack, welding toward the edge, and for the other type, a preliminary heating to remove latent stresses. Microphotographs are included to illustrate that the cracks follow the grain boundary.

SUPERCHARGING

Supercharging the Airplane Engine and Increasing Speed with Altitude, Robert J. Nebesar.

THE best available means of increasing the speed of the airplane are analyzed to obtain a criterion of efficiency which even for greater speeds can be kept reasonably high. A simple mathematical equation for the close estimation of increased speed at altitude is developed and the effect of size of plane in obtaining high speed and flight efficiency is discussed. Advantages of supercharging and of the larger planes are enumerated. The author points out the savings in weight, greater comfort for passengers, better inherent stability, and lower operation cost per passenger obtained with the larger planes.

WATER RECOVERY APPARATUS

Water Recovery Apparatus for Airships, C. P. Burgess.

FIVE alternates to valving helium for maintaining equilibrium in an airship when the liquid fuel has been burned are discussed and the development of a method for recovering water for ballast from the engine exhaust gas is outlined. An explanation of the theory of such water recovery is accompanied by illustrative examples.

The disadvantages of the water recovery apparatus employed on the airship *Shenandoah* and later on the airship *Los Angeles* and attempted improvements are taken up. The author's objections to fins for cooling surfaces and to cooling by the Lorenzen exhaust-gas turbine are explained. The desirable features for an efficient ballast collector are presented. Details of the ballast collectors now installed on the *Los Angeles* and one to be tested on the same ship, as well as the design of a novel type of ballast collector contemplated for the airship *Akron* are given.

WING RADIATORS

Wing Radiator Development, G. A. Luburg.

THIS paper is a summary of such data as are available on wing-radiator design and construction and contains experimental data of the Curtiss Aeroplane & Motor Company. The designs of the Curtiss

(*Continued on page 112*)

73 HOURS WITHOUT REFUELING!

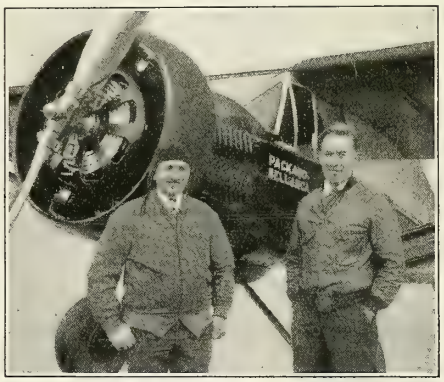


Exceeding AMERICAN ENDURANCE RECORD WITH THE PACKARD-DIESEL

AT Jacksonville last month a 225 h. p. Packard-Diesel powered Bellanca exceeded the American and came within one hour and thirty-five minutes of equaling the world's Non-Refueling Endurance Flight Record. Taking-off in 31 seconds on April 12th with a gross load of 6,666 pounds, including 458 gallons of fuel oil, the ship stayed aloft 73 hours and 48 minutes—exceeding by 14 hours and 29 minutes the American record made in 1928 by Brock and Schlee with a 225 h. p. gas engine.

Only a violent storm accompanied by total loss of visibility, which forced the Bellanca down with engine functioning perfectly and with enough reserve fuel for several hours of additional flight, prevented the almost certain capture of the world's Non-Refueling Endurance Record of 75 hours, 23 minutes. This record is recognized as one of the most important and sought-after records in aviation, for not only must the powerplant function perfectly and economically during the grueling flight but at the start it must pull a tremendous load off the ground.

The power, endurance and economy demonstrated by the Packard-Diesel on this phenomenal flight are but typical of its every-day performance. To commercial operators and air-line owners the Packard-Diesel points the way to greater pay-loads and increased reliability of operation under all flying conditions.



Walter Lees, left, pilot, and Frederic A. Brossy, co-pilot of Packard-Diesel powered Bellanca on the record-exceeding flight.

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ASK THE MAN WHO OWNS ONE

PERSONAIRLITIES



DID you ever watch a squirrel storing away nuts for the winter? He runs off with a nut, digs a hole, buries it, and scampers away. You might think that nut was gone forever, and that he never could find it again. But watch him come out on a fine winter's day, sniff around, and in a moment dig up what he had buried three months before. How does he do it? Possibly by memory, but more probably by smell—though what smell is there to a walnut in a shell?

I'm really a very old squirrel who has been storing up literary provisions for so long that he has an inexhaustible store. Sooner or later—usually later—every one of these biographical notes, or nuts, is dug up and pawed over. For instance, here's some information about Ira B. Reed that I've had for over a year—just as good as it was the day I buried it out behind the barn.

Now, in one respect, I resemble that squirrel. In the summer I store up nuts in the form of biographical notes about pilots; and in the winter, when provender is scarce, I dig them out. Kind friends who have tossed me these literary nuts so long as a year ago may have come to the conclusion that, like the squirrel, I have buried them somewhere; but that, unlike the squirrel, I've forgotten where I stored them. Not so. Squirrels, writers, and elephants never forget. Of all the hundreds of biographical notes I have made, or that the boys have given me, I haven't mislaid one. They're all buried somewhere about my farm, simply waiting for me to dig them out.

IRA REED was born May 9, 1904, at Tallequa, Oklahoma, and started flying in 1926 at Lambert Field, St. Louis, in an old Standard. I've just looked up the word "standard" in the dictionary, and find one meaning is: "An upright timber, post, pole, or beam, used especially as a support." This was undoubtedly the meaning intended by the manufacturers of the old Standard. It's full of posts, poles, beams, and supports; in fact, it was the sole support of many an old pilot. It was the post, pole, or beam with which he pried a living from a reluctant world. Ira Reed bought one of the things himself and proceeded to dig up a living as a barnstormer in the Southern States. The slim figure he enjoys to this day is probably due to the slight amount of nourishment he dug up with the help of that Standard.



Ira Reed

Remembering the advice of the late Horace Greeley, who said: "Go West, young man"—and then stayed in New York, himself—Ira flew slowly toward Los Angeles. He flew slowly because that was the only way you could fly in a Standard. He writes: "I finally landed in Los Angeles." That's the way anyone describes a trip in a Standard or a Jenny—"I finally got there."

And what did Ira do when he arrived in Los Angeles? Did he join the congregation of the sainted Aimee and live a good life thereafter—except for an occasional trip into the desert? He did not. I regret to record it, but Ira fell under the spell of the movies and became a lost soul, far removed from grace—and Aimee. He blossomed out as a stunt pilot, and flew in many of the air films, including "Lilac Time," "Hell's Angels," "Legion of the Condemned," "The Air Circus," "The Flying Marine," "Dawn Patrol," and others. He was also personal pilot for Reginald Denny, flying his original Sopwith Snipe with Bentley 220—which at the end of the war was England's latest scout plane, or pursuit ship, as we'd call it.

I had heard about a peculiar accident Reed had experienced in the filming of "Hell's Angels," so I wrote him about it and asked for particulars. Of course, you've seen the show and remember that dog-fight—probably the most amazing air work ever performed for the movies. Well, here's a little part of that fight, from the inside, described by Lt. Ira Reed, who played and flew the part of a German Ace:

"Toward the completion of the filming of the picture, we were doing a dog fight around the bomber, which was flown by your well-known friend, Captain Roscoe Turner. The fight was between sixteen English ships and seventeen German Fokkers. I was flying the second Fokker, on the left wing of the German formation. We were flying at about 8,000 feet, and a little ahead and to the left of the bomber. The English ships were coming, head on, about 200 feet higher.

"We came together, and the fight for your life was on—and I mean *your life*. Ships were going under you and over you, and all around you, on both sides. Frank Clark was leading the German formation, and when we came together, he started banking to the right. I was on the tail of an SE-5, and started into a vertical.

"There was a crash. Looking over the side, all I could see was somebody's landing gear and wheels going through my wings! The speed at which that ship hit me coming out of its dive was so terrific it rolled me over on my back, and the ship went into a spin.

"I stopped the spin after about five turns and pulled the ship up in almost a stall, and started to bail out. I had one foot on the wing and my other foot on the seat, pulling the ship up with my right hand on the stick. I was ready to jump, when I started looking about, and all I saw were ships all around me, above and below, milling around. I happened to shake the stick, and the ship answered control with one wing, so I climbed back in and decided I would try and make the airport. About that time, Frank Clark came along, after seeing Murphy, the pilot of the ship that hit me, bail out, and his ship crash to the ground. We were still about 3,000 feet above the clouds, and no ground to be seen anywhere. I didn't know whether I was over Oakland or the bay. Clark signaled for me to follow him, which I did, and started through the clouds on his tail.

"Somehow or other, when we came out of the clouds, I was down in a canyon and Clark had come out on top of the mountain. I started following the canyon, looking for a place to sit down. None was to be had. I came down to about a hundred feet from the ground, and started to climb back up and go to the airport, although I did not know where I was. I found I had lost so much surface off my wings, that she would not climb at all, only fly sideways, with the wing hanging down. So, all I could do was to follow the canyon, which I did for about twenty-five minutes. Then, to my embarrassment, the damned thing ended, straight up and down! And there I was boxed in and could not make a turn. Just as I had started to look for a nice soft tree to pancake into, I saw a ploughed field at the foot of the canyon; so, by some ungodly luck, I got down and climbed out to see what damage had been done. Looking at my watch, it was exactly forty-five minutes from the time of the accident until I reached the ground.

"I started out in search of a farm house, that I found about three miles off, and asked the farmer how far it was to the Oakland airport. To my surprise, I had flown forty-five miles in the wrong direction. Sonal, California, was the nearest town, and that

(*Continued on following page*)



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The FAIRCHILD 22 embodies all of these features:

Full size . . . licensed for 1400 lbs. . . . top speed 105 miles an hour . . . climb 650 ft. per minute . . . Rover 4 cylinder inline inverted air-cooled engine developing 75 H. P. at 1975 R. P. M. . . . all-steel fuselage structure . . . all-metal ailerons . . . two cockpits, each 27 inches wide and 32 inches long with parachute type seats . . . dual controls . . . stabilizer adjustable from both cockpits . . . oil hydraulic shock absorbers with 8 inch travel . . . low pressure tires . . . brakes . . . and complete instrument equipment including airspeed indicator, altimeter, tachometer, oil pressure and oil temperature gauges, carburetor choke and carburetor heater control.

CONSIDER the features of the Fairchild 22. Then consider that the price is only $2,675.00.

This new Fairchild airplane offers the same finish and workmanship that have earned Fairchild airplanes a world-wide reputation for durability.

The Fairchild 22 has flying qualities that won the praise of all the well-known pilots who flew it at Detroit and checked it against their exacting requirements.

And most important, the Fairchild 22 is the product of an organization that has been a leader in the field of aviation for ten years. It has built over 500 airplanes. Today it is in the strongest financial position in its history.

Let us tell you more about the Fairchild 22.

Manufactured by

Kreider-Reisner Aircraft Co., Inc., Hagerstown, Md.

Division of the

FAIRCHILD AVIATION CORPORATION

(PersonAIRlities continued)

was six miles down the road. He loaned me a mule to ride to the town. You can imagine how I looked riding a mule, with a parachute on. I was afraid to leave the parachute with the ship. Judging from the looks of things, the chute was worth more than the ship."

And that's that. Ask yourself if you would have ridden that ship down, or stepped off and continued your journey by parachute. My own answer is that if I had been playing the part of that German Ace, the Caterpillar Club would have had another member. Incidentally, the "Fokker" that Reed was flying seems to have taken out American naturalization papers, or something. I almost forget what a Fokker D VII looks like, but this one seems to have lost its German accent. I guess it's one of those Wichita Fokkers you often encounter in the movies. Page Walter Beech.

THE 17th of May, 1917, brought disaster to the Hotel Robideau at St. Joseph, Mo. The assistant manager left the Robideau flat, and took off for the war. Staggering and reeling under this blow, the Robideau got through the war somehow, while the former assistant manager turned up at Kelly Field, Texas, as company clerk of the 38th Aero Squadron. In July, 1917—promotion was rapid in those days—the company clerk, ex-assistant manager of the Robideau, became, at a bound, Sergeant G. H. Benefiel, and by the end of that month, Sergeant 1st Class. In August, he was sent to Rantoul, Ill., with the 38th, promoted to M.S.E., and assigned to flying training under Bert "Fish" Hassell, who at that time had not experienced the pleasure of strolling about Greenland with Shorty Cramer.

On January 29, 1918, 1st Lieut. G. H. Benefiel was a complete aviator, eager to be at the enemy, so, in February of that year, he was sent overseas to see what, if anything, he could do for democracy. He could do anything, it appeared, except actually to go after the enemy, for the authorities assigned him to advanced training



Captain G. H. Benefiel



Ira Reed made a landing unscheduled in "Hell's Angels" scenario

at Issoudon in March, and to instructing in July. Then in October, they made him a Tester of Flying Students and kept him at it until after the date when the open season on Germans had closed with a final bang! After November 11, you know, anyone taking a pot shot at a German was liable to have his hunting license revoked. So, Benefiel returned to America without having inflicted damage on anyone but the good old American taxpayer, who, after all, was the chief sufferer in that war. He had enjoyed all the advantages of a Cook's Tour of France without having to supply his own Travellers' Checks.

Deciding to continue as a tourist, even after the Army stopped supplying him with free transportation when they gave him his discharge in February, 1919, Lieutenant Benefiel purchased a Jenny and barnstormed Iowa, Nebraska, Kansas, and Missouri that year. He often said he wanted to travel the worst way, and he achieved his desire. In July of 1919 he was appointed 1st Lieutenant in the Reserve, and in August, 1925, was promted to the dizzy heights of a captaincy. Meanwhile, as he was slowly wearing out the Jenny, and getting leaner and leaner day by day, he noted the startling fact that there were more people who wanted rooms in hotels than there were people who wanted rides in airplanes. So, he flew in to Tucson, Arizona, and found to his surprise that it was pronounced Too-zon, with the accent on the zon, and not Tuck-son, with the accent on the Tuck, though why that should be nobody has ever discovered. Here he parked his chariot and put up at the Pioneer Hotel, hoping to carry enough passengers to enable him to pay his board bill.

It was a vain hope. He soon owed a week's board, then two weeks', then a month's. The proprietor saw there was only one way to get that board out of Benefiel—make him work it out, without the assistance of a Jenny. So he made him manager of the Pioneer, so he could have a free room and gradually pay his back board. I know there are various stories about how Benefiel got that job, but that's the way it really happened. And, as it turned out, it was a mighty good thing for the Pioneer, for G. H. Benefiel has made that hotel the headquarters of all aviators passing through Tucson. Such famous airmen as Cliff Henderson and Pop Cleveland add a note of old-world culture to the Pioneer every now and then. Ordinary citizens, glad to pay for a look at such notorious personages, crowd into the place and buy meals, after which they aren't charged anything to look in at the pilots' club room, donated free by the management.

Benefiel has practically no bad habits, outside of an inability to say "no" when anyone asks him to join things. This weakness finally got him into trouble. He joined the Aviation Committee of the Tucson Chamber of Commerce, the Shriners, and the American Legion. If he'd stopped there, he'd have been O. K. But the poor fellow went ahead and joined the N.A.A. Delighted to have one good man join the thing, old Hire'em Bingham made him National Aeronautic Association Governor for Arizona, and he's never been the same since. He started at once to make the N.A.A. into something, which is an effort comparable to filling a sieve with water. The more effort he pours into the N.A.A. in Arizona, the more runs out through the leaky sieve of the Washington Headquarters. I expect almost any day now that Benefiel will notice this fact, himself, and quit. Meantime, Lord Bingham is grateful for any Arizona donations to his political prestige.

THE gentleman who looks like a bandit or a Bronx beer baron is not really a desperado. He's just a trusting old pilot who was unfortunate enough to believe the advertisement of one of those passport photo establishments who pretend that they can take your picture. In he went, sat down, looked pleasantly into the lens—and this is the shocking result! I believe he has good grounds for legal action against that photographer, if some other maligned person hasn't already done away with the gentleman. For E. L. Neill isn't nearly as bad as he's pictured. He couldn't be, and escape even the New York Police Department, which is noted for its inability to recognize crooks, especially when they're on the Force or on the Judge's Bench.



E. L. Neill

Neill was in Buenos Aires, Argentina, on a year's tour of South America in the interests of the Spartan Aircraft Company when his activities were ended by the late revolution. I'd have thought that a revolution was just the thing to stimulate airplane buying, but it seems not. Or else Neill incautiously displayed this photograph of himself and thus scared off the customer. Anyhow, he broke through the lines by brandishing this passport photo and throwing the troops into disorder. During the ensuing confusion he escaped aboard a boat for New York. While he still was in South America he sent me this brief resume of his life.

(Concluded on following page)



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(PersonAIRlities continued)

"Well, I am just a poor country boy from the tall timbers of eastern Texas who came to town and grew up. Being dissatisfied with my surroundings, I went to California to attend Leland Stanford University. The faculty there did not prevent my graduation about a year before the Big European Skirmish.

"Having played with hot-air balloons, gliders, etc., during my youth, I decided to try and enter Uncle Sam's fighting air force. I attended the University of California ground school and later went to the flying school at March Field, near Riverside, California, became an instructor there and soon after was discharged to civil life, as the war was over. Having to eke out an existence, I tried to enter the practice of engineering in California, Arizona, Mexico, Central and South America. Between engineering and aviation I have been able to keep alive.

"The parrot is a bird that talks a lot and flies but little. The condor is a bird that lives in the Chilean Andes, flies a lot but never talks. I will try and imitate the condor by ending this letter after I have called your attention to the fact that my early experience with hot-air balloons has left its mark."

THE Naval Air Station at Lakehurst —two o'clock in the morning of April first. A chill, driving rain is sweeping in from the Atlantic, bringing with it the salty smell of the ocean, the odor of wet pines and wet earth, the pungent smell of the tidal marshes of New Jersey. Darkness, cold, rain, discomfort is the lot of those enlisted men of the United States Navy who have turned out of their comfortable berths to drive the long, dreary road to Washington and the Arlington National Cemetery.

They take their places in the cars, silently, gazing ahead at the circles of light that serve less to illumine the way than to intensify the blackness of their surroundings. They settle themselves for the long, weary journey, apparently oblivious of the weather, of each other. They are not required to be in those cars; no orders have been issued that they should leave their berths to travel those dreary miles. They are going of their own volition—going to pay their respects to the memory of Lieutenant Charles E. Bauch, U.S.N., who at eleven o'clock that day will be laid to rest in Arlington among the courageous dead of our nation.

A simple pen picture in two short paragraphs! How few words are there—yet how much they tell! When you and I, my friend, lay down our burdens and say farewell to sorrow and joy, what worth-while lives we shall have lived if only such words may be written of us. That our fellow men should be grieved at our passing, that willingly they should endure cold and discomfort to do honor to our memory is tribute enough for any man.

Lieutenant Charles Bauch was buried that



The late Lieut. Charles E. Bauch, U.S.N.

day with full military honors. Admiral Moffett attended the ceremony; as did Captain Shoemaker, Commandant of the Air Station at Lakehurst; Commander Berry, Commander Clarke, Commander Rosendahl, Commander Weyerbacher, Lieut. Taylor, Lieut. Whittle, Dr. Davies and many others who knew Charles Bauch. These officers went, not to take part in what sometimes is a mere formal ceremony, devoid of feelings of personal loss, but to pay their respects to a friend whom they had honored and loved. Even so, their kindly tribute does not prove so much to me as does that dreary journey taken by those enlisted men from Lakehurst.

I have been asked by a close friend of his to place here a brief record of the career of "Charlie" Bauch. I am ill fitted to perform the task, for I had not the pleasure of knowing him personally, though I had heard much of him—and all in the warmest vein—from several sources. In Akron, a week ago, I learned from his friends there how keenly they feel his loss. He is mourned in Akron as sincerely as he is throughout the Service, and to many a friend in that city the first flight of the giant Navy Zeppelin *Akron* will not be the happy affair it would have been if Charles Bauch had lived to fulfill his assignment to be an officer on the greatest of all of the Navy's airships.

It was in Akron during the days of the war that Lieutenant Bauch had qualified as a free balloon and airship pilot, at the Wingfoot Lake Naval Training Station. He became immensely popular there during those months of his initial Akron residence; and he received a cordial welcome when he returned for the National Balloon Race from there, and later for numerous speaking engagements. At National and International Balloon Races from other cities, Akron balloonists always found the smiling and cheery Charlie Bauch on hand as Navy Operations Officer, and had grown to feel that a balloon race without him would not be complete.

Lieutenant Bauch was born May 26, 1897, at Boston, Mass. He attended the Huntington School and Tuft's College at Boston. In April, 1917, he enrolled in the Naval Reserve Force with the provisional rank of Ensign in the Flying Corps. He attended the Ground School Course at the Massachusetts Institute of Technology and qualified as a Free Balloon and Airship Pilot with the Naval Aviation Detachment at Akron, Ohio. In June, 1919, Lieutenant Bauch was designated a Naval Aviator (dirigible) and assigned to duty involving flying in aircraft, including dirigibles and airplanes.

Lieutenant Bauch was the pilot of the Navy's first semi-rigid airship and was on the initial flight of the C-7, the first airship to be inflated with helium. During the construction of the *Shenandoah,* he was assigned to duty as an assistant to the Manager of Construction at the Naval Air Station, Lakehurst. He was a member of the Trial Crew of the *Shenandoah,* as well as a member of the *Shenandoah's* regular complement until her destruction near Ava, Ohio, in September, 1925. Lieutenant Bauch landed in the after section of the *Shenandoah* and directed the successful efforts of the survivors in that portion of the ship to save themselves. He made the trans-continental flight of the *Shenandoah* in 1924, as well as a number of the outstanding flights of the *Los Angeles,* as he later became a member of the crew of that ship. He was one of the Navy's most widely experienced lighter-than-air officers.

He was on duty in Akron in connection with the fitting out of the ZRS-4—the U. S. S. *Akron*—and was returning in an official car from a reception held in his honor when he met death in an automobile accident. The driver, blinded by the lights of an approaching car, struck the side of a bridge. Four hours later the gallant officer who had survived a major air disaster had passed away.

What more is there to say? Words of sympathy to his wife and friends are useless. All that we in aviation can say is that we are sorrowful that he is gone and grateful that he has lived. All we can do is to express as best we may our appreciation of the service he has given to the progress of lighter-than-air development, the worth of which is known to those who worked with him.

Through discouragement and failure, Lieutenant Bauch, and those others who have held firm their faith in lighter-than-air, have kept at their task with a courage and devotion that commands the respect and admiration of us all. In this new air giant, on which Lieutenant Bauch would have been so happy to serve, let us hope that the friends and supporters of this phase of the science of aeronautics will have their faith fully justified. A triumphantly successful ship will be the most fitting memorial to those splendid men who, like Lieutenant Charles E. Bauch, U.S.N., have devoted their lives to its perfection.



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OUR READERS AIR THEIR VIEWS

W. H. M. Watson, non-flier who wants to fly, describes the ideal airplane for private flying:

"We, the public, are not interested in how many outside loops a plane can make, how many feet it can dive without shedding its wings and how many hundred miles per hour it can go. Our greatest interest is safety, economy and fair speed—speed of, say, seventy-five miles an hour cruising speed and ninety or a hundred miles for high speed.

"Landing speeds of twenty-five miles an hour are reasonable for general use, but speeds of fifty or sixty for landing are simply out. Gasoline consumption of around twenty-five miles to the gallon can be expected by the business or sportsman flier.

"It seems to us, the general public, that airplanes are being built for a special group just as race cars are today. To handle one the pilot has to be up on all the tricks.

"Cannot a plane be built that is sturdy, free from spinning characteristics, easy to land, has low gas consumption, not too much cruising speed, is equipped with a few instruments and possibly lights for night landing, accommodates two people—to sell for around $1,500? If not, then the aviation industry is destined for air mail, army and navy and trick exposition use only. It will surely never become popular. For myself, no matter how I cuss the rough roads in my car, no matter how long it takes to get to my destination, it will be a cold day in certain lower regions before I pay a thousand dollars to learn how to fly, six or seven thousand for a plane that might be blown over and crack up, three hundred dollars for propellers (how can there be that much money in a propeller unless it is made of silver inlaid with gold!) and other high and unreasonable prices.

"You have had many articles in your magazine by aviators telling what the trouble with the industry is. Well, here is an answer from a non-flying man who wants to fly, can afford to, but just isn't going to be beaten out of his money for a lot of steel tubing, fabric, and a funny looking motor that doesn't run any more consistently than a Ford car."

Charles M. Taylor expresses himself on the red tape with which certain states complicate the refund of gasoline taxes to aviation companies:

"My company has a claim for $1.68 tax refund for gasoline used for aviation purposes. We have taken the matter up with the State Controller of Public Accounts and have received a form letter relative to filing a report and a claim for the refund.

"We understand it will cost us $1.00 to file our claim, for which we hope to receive $1.68 in return, provided we have complied with all the technicalties of the law. If, through ignorance or error on our part, each step of the procedure is not properly made, then we not only fail to collect the refund of $1.68 but we also lose the additional $1.00 which we must post when the claim is filed. If the claim is disallowed we can only get out $1.00 refund through an appropriation from the Legislature.

"We do not know whether this complicated, unfair procedure is a result of legislative red tape or whether this system was purposely devised to discourage refund of this money to aviation operators. In any case, it is an unfortunate situation for the aviation industry and in our opinion if the practice is continued it will work a detriment to the State of Texas in aviation matters.

"In the recent session of the Arkansas Legislature a bill was created placing a tax on aviation gasoline. All money derived from this fund and an additional appropriation was placed at the disposal of the Aeronautic Department to be used for the purpose of laying out a statewide system of airports. Operators of scheduled passenger and mail service are exempt from this tax."

A sportsman pilot urges Governmental regulation regarding equipment of planes with parachutes and cancellation of schedules:

"I choose your column to air my views concerning two mistakes that are being made by air transport operators. The most important is the total lack of individual parachutes in our passenger planes or of a huge 'chute to bring the entire plane down safely, such as have been successfully tested in many parts of the country. The transport executives say that 'the presence of parachutes in passenger planes would suggest a possible danger and frighten prospective passengers.'

"On the contrary, the sight of parachutes would give a sense of confidence and belief that the company was doing everything possible for their safety. I have flown in both open cockpit and multi-motored cabin jobs and I personally feel much more secure in a small open ship with a parachute than in a huge airliner without one.

"The second bad condition on the passenger lines is that of forcing the plane through on schedule regardless of weather conditions. The public hears very little about the canceled flight, but it may hear much about one which is not canceled.

"There should be some sort of Government regulations about the cancellations of flights and regulations requiring all passenger ships to carry parachutes."

R. L. Gardner urges transport rates with a margin of profit:

"It was with a great deal of pleasure that I read the very comprehensive article in the January issue of AERO DIGEST called 'Cure All or Malady.'

"The points brought out have been heavily stressed by myself and associates for more than two years, and I have been roundly ridiculed for advocating the necessity of securing a price for service rendered which would permit of a margin of profit to which every operator of any means of transportation is entitled.

"I have found it impossible to understand the line of reasoning employed by supposedly hard-headed business men in determining that it was necessary to render a better and faster service than the railroads at the same price level.

"It is, indeed, a pleasure to read an article such as you published which shows conclusively that others besides ourselves have applied what might be termed roughly 'horse sense' to a national business problem."

T. A. passes on an idea for training a civilian air corps, an undertaking to advance aviation and develop a strong air defence:

"I wish to sanction an idea advanced in an article which appeared in *The World*, setting forth a logical method of advancing aviation and hastening the day when the aviation industry will take care of the unemployed.

"There is no reason why this idea should not be approved by the Government. Besides helping the industry and relieving unemployment, it would give us the best air defense in the world—something that we as a nation are entitled to.

"Here's the plan advocated by L. J. M.:

" 'Congress can appropriate a sufficient sum to handle a civilian air corps, just as it does to meet expenses for the Citizens' Military Training Corps in the summer. This air corps would be an unusual unit in that it would not only reduce unemployment but also make thousands of people airminded.

" 'The Government can purchase two or three mammoth fields in each of the forty-eight states, equip those fields for aviation along the latest lines—barracks for men, hangars for planes, office structures and even recreational buildings — purchase at least 100 planes for each field and enroll young men, twenty to thirty, for aviation courses of all kinds, *enrolling them on the basis of physical test requirements rather than on their book knowledge.*

" 'When they are able to pilot a plane to pass all tests, discard them to commercial enterprises in aviation and call them the Civilian Air Corps. This corps should have from 50,000 to 100,000 young men in the ranks at a single time. This will boost the number of pilots and persons interested in aviation by the thousands. It will make more work for the aviation industries, such as plane builders, makers of parts, etc. It will eliminate the $30-an-hour flying lesson charge and fit people to purchase their own planes.

" 'Through taxation of the commercial air enterprises, the Government can get some revenue, probably enough for all expenses.' "

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MINNEAPOLIS MUNICIPAL AIRPORT

By H. A. Lindbergh

THOSE who have arrived at Minneapolis via the air will recall that old familiar landmark, an abandoned concrete race track which has served as an oval boundary of a landing field for the past eleven years. This unused speedway, nearly all of which has already been removed, was to be entirely eliminated about May 1 as a part of the plan of developing the Wold-Chamberlin municipal airport into a Class A1A airport.

The project, which is nearly completed, includes a rectangular area lying between 60th and 66th Streets East and 34th and 46th Avenues South, with the exception of thirty-five acres in the northeast corner unsuited for airport purposes. The field at present is comprised of 325 acres; 240 additional acres are in process of acquisition. The field is about seven miles from the Post Office. The southeastern city limits of Minneapolis split the landing area in an east-west direction, so that the northerly one-third is within the city proper.

The airport dates back to 1920, when the Aero Club, composed of ex-war fliers, financially assisted by the Twin City Aero Corporation, and a group of public-spirited citizens of St. Paul and Minneapolis, created the Snelling Flying Field, comprising 208 acres within the speedway. On July 10, 1923, the field was dedicated in honor of First Lieutenants Ernest G. Wold and Cyrus Foss Chamberlain, who as members of U. S. Air Squadrons lost their lives overseas during the World War. In 1926 the late William F. Brooks, then president of the Twin City Aero Corporation, offered to turn over to the Board of Park Commissioners the company's option for the purchase of the property from the Snelling Field Corporation, amounting to about $128,000. The Park Board and representatives of various organizations advocated the acquisition of a municipal flying field to be financed through a bond issue. In 1927, moreover, the State Legislature passed an enabling act, under which the city council, Board of Park Commissioners or any governing body of cities of the first class could acquire land and equip such as a municipal airport. This legislation limited bond issues to $150,000.

The field was acquired from the Snelling Field Corporation for $165,000 and on June 1, 1928, the ownership and management of the municipal airport was assumed by the Board of Park Commissioners, of which Theodore Wirth, widely known for his development of the Minneapolis park system, is the superintendent, engineer and designer. A. E. Berthe is the assistant engineer and L. D. Hammond, manager of the airport. Through the adoption of revised plans it was fixed that hangar space lots 150 feet by 200 feet would be leased to various parties at a rental of $100 per month. The hangar erected on Lot Six for the Naval Reserve was deeded to the Board in lieu of the rental. The grounds occupied by the Naval Militia bring an income from the State to the city of $5,000 per year.

The funds available for the improvement of the field and the acquisition of additional acreage were inadequate, so the State Legislature passed a bill authorizing the issuance of airport bonds to the amount of $450,000 by cities of the first class. Of the additional funds, Minneapolis will spend $133,750 for the annexation of 240 acres south of the present airport, purchase of which is now being negotiated.

When the surface of the field received the finishing touches during the past year, about 500,000 cubic yards of dirt had been moved, making it an all-way field. The grading has been done so there is a slight slope toward the southeast corner; the sandy soil takes care of the drainage under all weather conditions. Where it has been necessary to fill in or remove dirt, the area has been resurfaced with loam, then rolled and seeded. The tenants obtain water from a six-inch main laid on the west side of the field, which is fed at the city pressure of seventy-five pounds per square inch. Fire hydrants are spaced about 600 feet apart.

Directly behind the hangar line on the

(*Continued on following page*)



Development plans for Wold-Chamberlain Field include removal of the old race track boundary

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Views of the administration buildings which house offices and pass terminal facilities at Wold-Chamberlain field

west side, and running the entire length of the field, is a service roadway. Between this roadway and 34th Avenue is parking space for hundreds of cars. In order to prevent the automobiles on the service roadway from moving into the hangar space lots, wooden posts have been placed along the entire west side, connecting with the metal fence on the northwest curve of the field. People are prevented from walking out on the landing area by a heavy wire and wrought iron type fencing, the poles of which are set in concrete. At the present time the entire west side is enclosed with a four-foot-high fence and part of the north and south ends is also protected from trespassers. Double gates with fifty-foot openings allow planes access to or from the one hundred-foot-wide concrete taxiway, which is 1,300 feet long and runs in front of the west side hangar lot line. The fencing of the entire airport will be completed during the year.

The night lighting system, which employs Crouse-Hinds equipment, would allow an A rating to be obtained from the Department of Commerce. In the loop district of Minneapolis, seven and a half miles from the airport, is a DCB-24 8,000,000 candlepower revolving beacon (thirty-two volt, 1,000 watt) with automatic lamp changer turning counter-clockwise at two revolutions per minute. The beacon is set 450 feet above the sidewalk on the Foshay Tower, with the beam set at an angle of one degree above the horizontal. Below this beacon and pointing towards the field is a DCE-24 directional searchlight without lamp changer. On top of a fifty-foot tower located directly west of the administration building is a DCB-24 8,000,000 candlepower revolving beacon with automatic lamp changer, turning clockwise at six revolutions per minute. The windsock on the tower is lighted by an LCE-12 floodlight pointing downward. The sixteen DCE-24 landing field floodlights, which are of thirty-two volt, 3,000 watt power and have a forty Form S spread lens, are placed about the field ten feet above the ground on supporting standards with weatherproof housing for transformer and fuses. Under this arrangement the landing area is lighted all ways during the summer. In winter only the three 300 by 2,400 foot runways are lighted. The taxiway is lighted by five DCE-24 floodlights. Distributed about the field and where necessary are sixty VAP boundary lights with galvanized sheet steel marking cones, twenty-four VAP obstacle lights and sixteen VAP approach lights with marking cones. The current for interior illumination is supplied through a 2,200 volt power line on 34th Avenue, which is stepped down to 440 and 110, the voltage which is used. The exterior of the hangars is lighted by roof and wall lights.

In 1921 the first hangar, an eighty feet by ninety feet wooden structure, was built for the use of the Aero Club. It is at present the property of the city, by whom it is leased to the Mohawk Aircraft Corporation and surplus planes not finding space at other hangars on the field. Also located on the north side are the three sixty-four feet by 120 feet wooden hangars erected by the state in 1923 for the 109th Aero Squadron and now used by the Naval Militia. To the west of this group is another hangar, a steel one, used by the Navy. On the west side are three eighty feet by 100 feet steel hangars, one of these being the property of the Northwest Airways, Inc. Adjacent to this hangar is a small passenger station and field office. The other two hangars are used by the Universal Aviation Corporation. On the east side of each of these buildings are two-story brick additions, each twenty feet by sixty feet. On the west side of the northern hangar is a thirty feet by 100 feet brick repair shop.

The two-story administration building, which is constructed of concrete and brick, measures forty feet by 143 feet. It was completed during the past summer by the Henry F. Olson Company, at an estimated cost of $57,000. In the basement of this structure are the boiler room, coal bin, storage space, men's and women's rest rooms. The main floor houses the airport manager's private and general office, waiting room, dining room and lunch counters, concessions, kitchen and vestibule. On the second floor are the weather and radio room, pilots' lounge, dormitory, bedrooms, men's and women's rest rooms.

There is a forty gallon extinguisher on wheels at the field in addition to the city water, while the "emergency car" from the nearby U. S. Veterans' Bureau also answers all calls for aid.

Passenger traffic at the airport during 1930 totalled 5,958 transient passengers and 1,802 passengers over scheduled lines.

According to the records there are seven days per year when there is a dense fog and four days per month of light fog. Once each month there is a period during which there is rainfall of one inch or more in twenty-four hours. The average monthly precipitation is four inches from April to November; the prevailing winds are southeast in summer and northeast in winter. The weather reports are received via the radio and through phone calls from the Government station at the St. Paul airport.

Through these developments Minneapolis is presenting tangible evidence of its belief that an airport is a valuable and necessary civic asset, and of its intention to make Wold-Chamberlain into a Class A1A airport.

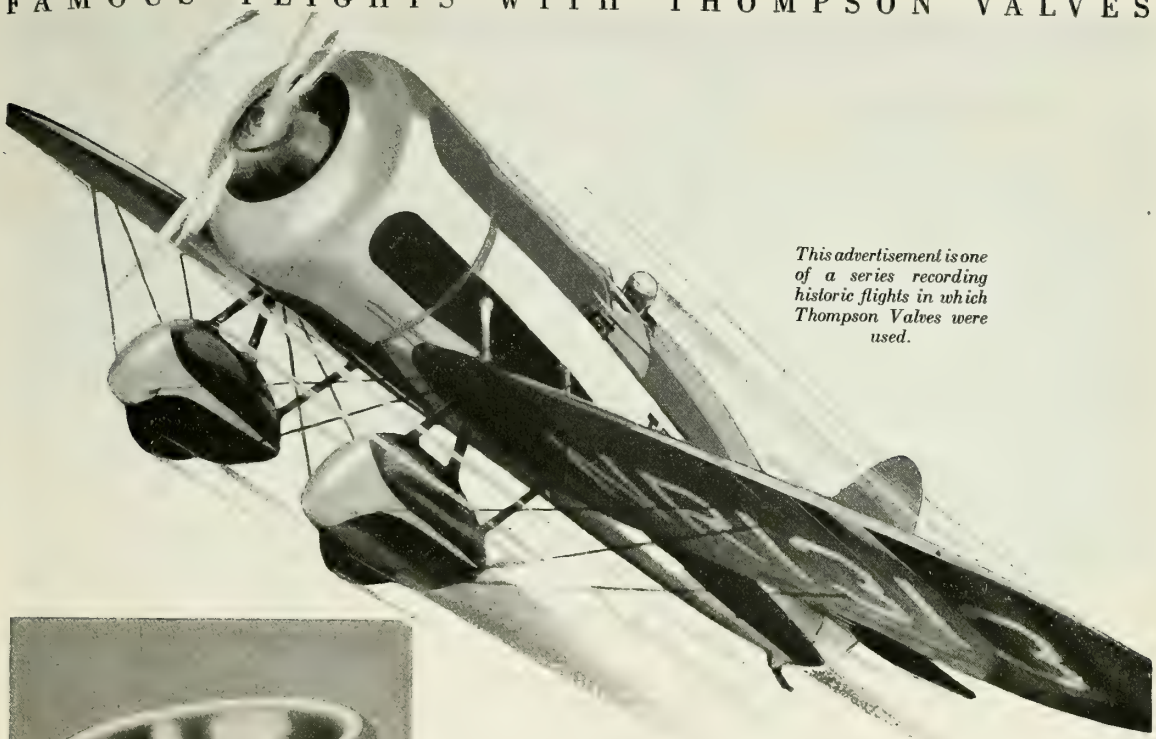
Department of Commerce to Issue Bulletins on Radio Navigation Aids

AIRMEN flying along the Federal airways system will be provided with a convenient index to the radio aids to air navigation by a new series of Airway Bulletins, published by the Aeronautics Branch, the first of which will be available soon.

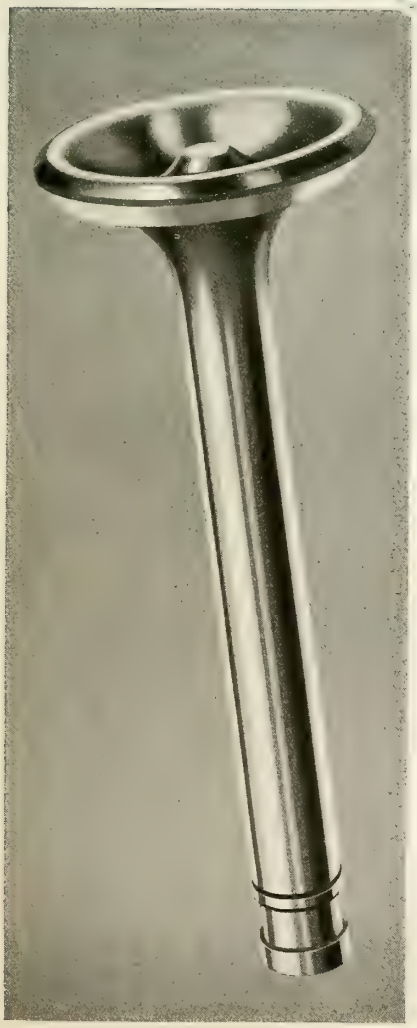
The information will be given in map form, the various facilities being shown in their respective places on an outline map of an airway. By suitable symbols, the radio broadcast stations, range stations, and marker beacons which have been installed by the Department of Commerce will be indicated in their respective positions on outline maps of the airways in the new bulletins. Opposite each facility will appear a brief description including the call letters, frequencies, and broadcast schedules of radio communication stations, the frequencies on which the various radio range and marker beacons operate, and the code signal.

In some cases, both radiotelephone broadcasts and radio range beacon signals emanate from a single station but not simultaneously. In others, an independent communication station is synchronized with an independent range station at some other location so that both may use the same frequency, operating alternately, with the range on the air while the communications station is silent, and vice versa. The arrangement in effect for each station will be mentioned in the radio aids bulletin.

FAMOUS FLIGHTS WITH THOMPSON VALVES



This advertisement is one of a series recording historic flights in which Thompson Valves were used.



FLASHING WITH HAWKS FOR A TWO-WAY CROSS-CONTINENT RECORD

On August 6, 1930, Capt. Frank Hawks raced the sun westward from New York to Los Angeles in his trim little Travel-Air monoplane, setting a record non-stop mark of 14 hours and 50 minutes against the prevailing winds. A week later, taking off before dawn for the return trip eastward, he kept a dinner engagement 2800 miles away after only 12 hours and 25 minutes of flying!

Across the continent and back in elapsed time hardly greater than the span of a single day! Naturally, such remarkable speed imposed a grueling test on the Wright Whirlwind motor that made it possible. And, naturally, like so many other motors of leading makes which have come through such record-breaking tests with flying colors, it was equipped with eighteen Thompson Valves.

THOMPSON PRODUCTS, INCORPORATED
General Offices: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT

Thompson Valves

CURRENT AIRPORT AND AIRWAY FACTS

T. & W. A. Opens Twenty-Four Hour Coast-to-Coast Express Service

A TWENTY-FOUR-hour mail and express coast-to-coast service was inaugurated on April 20 by Transcontinental and Western Air, Inc.

This speeding up in the flying time of mail planes is made possible through the use on the Western leg of the Kansas City-Los Angeles run of planes which will maintain an average speed of 140 miles an hour.

Under the new schedules, the fastest yet between the Atlantic and Pacific coasts, westbound tri-motored planes carrying mail and express will leave Newark Airport at 10:45 a. m., arriving at Kansas City at 9:10 p. m. There the mail and express will be transferred to single-motored planes for air transport to Los Angeles. Planes will leave Kansas City at 9:30 p. m., arriving at Los Angeles after a night flight at 7:42 a. m.

The eastbound schedule from Los Angeles will be equally fast. The planes will leave Los Angeles late in the afternoon, arriving at Newark Airport at 8:44 p. m. the next day.

The new Transcontinental & Western Air fast mail and express service will not be required to carry passengers until remaining portions of the route between Barstow, Calif., and Winslow, Ariz., are lighted. Department of Commerce work on these unlighted portions is expected to be completed soon, when the T. & W. A. twenty-four hour coast-to-coast passenger service will be announced.

The thirty-six hour passenger schedule which the company has maintained for some time was recently cut to thirty-three hours. Under the speedier schedule passengers leave Newark at 10:45 a. m. and arrive in Los Angeles at 8 p. m. the following day.

New Regulations Require Approval of Flares for Passenger Planes

PARACHUTE flares to be used by planes carrying passengers for hire at night are required to be approved by the Aeronautics Branch of the Department of Commerce, the Department has announced.

Manufacturers desiring approval for their flares will submit five flares of each type, for which approval is asked, accompanied by a complete set of dimension drawings, showing all construction details together with complete material specifications for each type of flare. The flares will be tested by the engineering inspectors of the Aeronautics Branch, who will drop them to time the period of descent, period of illumination and to gauge the intensity of the illumination.

In the event there is one failure out of the five submitted, five additional flares must be presented for test. Failures of two or more flares out of ten dropped are grounds for disapproval.

Flares for aircraft carrying in excess of two passengers for hire are required to have a light duration of at least three minutes and a candlepower of 500,000 or more. The rate of descent may not exceed 550 feet per minute. A letter of approval which authorizes use of the flare will be issued to the manufacturers of flares which meet the Department's requirements.

Survey of Air Transport Operations During Last Half of 1930 Completed

A TOTAL of 417,505 persons were passengers on the domestic and foreign scheduled air lines of American operators during 1930, more than twice as many passengers as were carried by the scheduled air transport companies in 1929, the Aeronautics Branch of the Department of Commerce announced upon completion of its survey of operations for the last half of 1930.

The miles flown in 1930 were 36,945,203, an increase of more than 10,000,000 over 1929. Mail carried in 1930 amounted to 8,324,255 pounds, and express to 2,869,255 pounds, both figures representing substantial increases over the previous year.

Traffic Out of New York City Heavy During First Week in April

THE upward trend of passenger carrying business was demonstrated in the traffic out of New York during the week of April 1 to 7 over the Transcontinental and Western Air coast-to-coast service. Every ship of this airline leaving Newark Airport during the week carried a capacity load of passengers. On Friday it was necessary to run two sections, carrying seventeen passengers on the two ships bound for Los Angeles and intermediate points. There was not a single cancellation during the week. Other airlines reported similar conditions.

Aeronautical Chamber of Commerce Completes Airport Activity Survey

ACTIVE airports in the United States handled 394,627 transport planes on their arrival and take-off during 1930, according to a survey by the Aeronautical Chamber of Commerce. The survey was based on questionnaires sent every three months to more than 750 active airports in the United States, of which approximately fifteen per cent were returned. With this as a basis the airport of the country as a whole was estimated.

The survey showed that a large number of the airports handled from two to four scheduled transport planes a day, while the majority reported between five and ten transport planes using the airport facilities each day. The largest ports reported handling as many as twenty transport planes a day.

A total of 281,863 transient planes were accommodated at airports. The survey indicated that private flying is affected by weather to a much greater extent than scheduled air transport, since the number of transient planes handled by airports dropped off sharply during the last quarter of the year.

It is estimated that there were 3.9 transport passengers per plane on the average in the first quarter in 1930, 4.8 passengers during the third quarter, and 2.4 passengers during the final quarter. Transient planes averaged 1.2 passengers, in addition to the pilot, per plane.

The volume of short hop and charter business in 1930 was slightly less than in 1929. Gasoline consumption totaled 27,413,420 gallons and oil consumption totaled 887,165 gallons during 1930.

Miles Flown Per Fatality Increases 1,000 Per Cent Last Six Months, 1930

OPERATION of the scheduled air transport lines of the United States with only two passenger fatalities during the last six months of 1930 resulted in an increase of approximately 1,000 per cent in the number of passenger miles flown per passenger fatality over the number of miles similarly flown in the first half of the year. This increase is shown in a detailed report of accidents in scheduled air transportation for the period of July to December, 1930, which has just been completed by the Aeronautics Branch of the Department of Commerce.

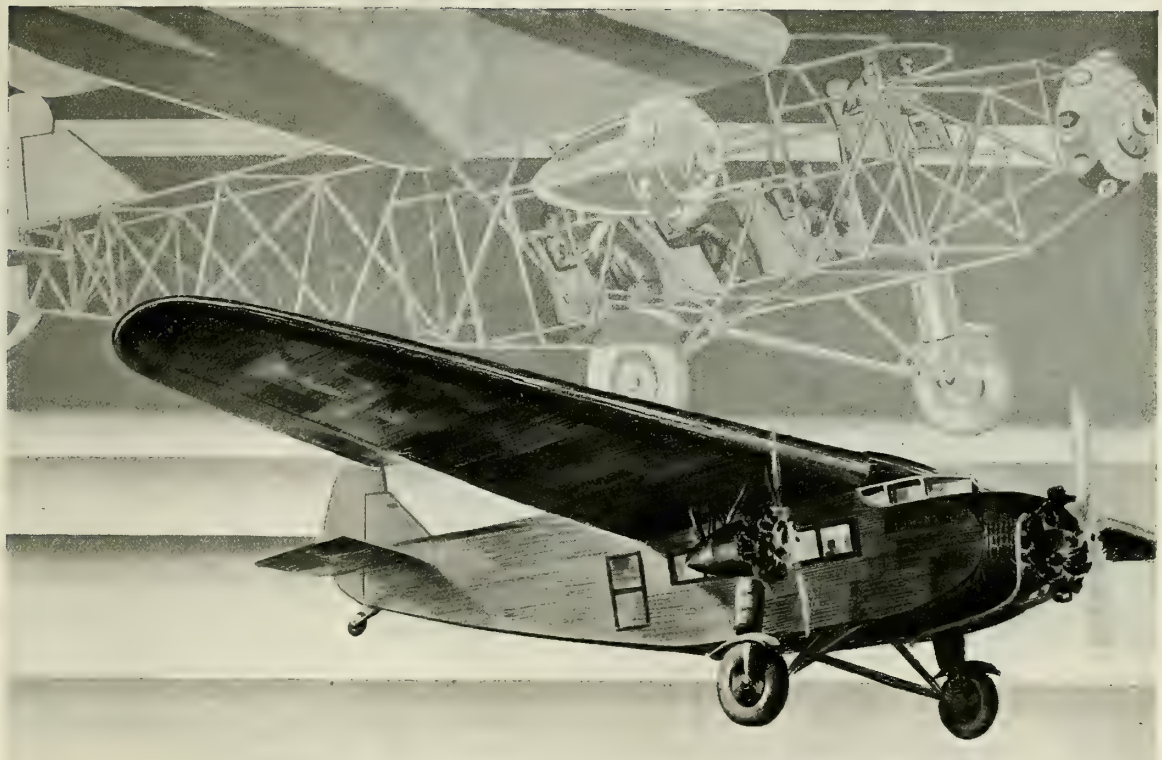
Operators of scheduled lines flew a total of 51,482,633 passenger miles during the last half of 1930, a passenger mile being the equivalent of one passenger carried one mile. In all of this flying there was but one fatal accident, this one involving two passengers.

Thirteen Radiophone Stations Installed Along Transcontinental Airway

THE Aeronautics Branch of the Department of Commerce has installed and placed in operation thirteen marker radiophone stations between New York and Salt Lake City on the transcontinental airway. Sixty-seven more stations will be established along the airways where necessary.

The stations now in operation are located on Department of Commerce intermediate landing fields at or near the following places: Allentown, Brookville and Numidia, Pa.; Bryan, Parkman and Vickery, Ohio; Helmer and McCool, Ind.; Grinnell, Iowa; Tarkio, Mo.; Big Springs, Neb., and Granger and Laramie, Wyo.

These stations are supplanting to a large degree the marker beacon which has been used on the airways for some time.



THE BONES OF AN EAGLE

THE plumes or the tireless muscles and sinews of an eagle that communicate the power of his unfaltering heart are not more to be admired than the bones upon which the whole mechanism depends for leverage. Marvelous framework! Massive at a few points but at others almost as thin as the walls of a straw, and on the whole, light enough to ride the wind without effort, high above the clouds. Yet strong enough to bear every strain that arrow speed, quick reverses, or the rush of mighty storms may impose.

Let one of these bones be broken and the whole miracle of flight comes to grief.

Tubing is to an airplane what the bony structure is to its prototype, the bird. No refinement of engineering, no scrutiny of materials, or application of skill, or control of process can be too great to make it perfect for so exacting a use.

The manufacturers of NATIONAL-SHELBY Tubing, long accustomed to the rigid requirements of the automotive industry have spared no pains to meet also the exacting tubing requirements of aircraft design.

NATIONAL-SHELBY Aircraft Tubing is available through distributors at various important centers. Ask for descriptive literature on NATIONAL-SHELBY—

America's Standard Aircraft Tubing

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

NATIONAL-SHELBY AIRCRAFT TUBING

THE AIR SERVICES

ANNUAL MANEUVERS OF ARMY AIR CORPS

CHARACTERIZED as the greatest concentration of military aircraft ever staged in peace or war time, the annual maneuvers of the Army Air Corps will be held during May along the Atlantic Seaboard, participated in by 672 planes, 797 officers and 687 enlisted men from the Regular Air Corps, Reserves and the National Guard. The organization, to be known as the First Air Division, will be under the command of Brigadier General Benjamin D. Foulois, Assistant Chief of the Air Corps.

Tests to determine the ability of the Air Corps to meet a major coast defense problem will be made over a territory covering more than 100,000 square miles and approximately a dozen states.

Personnel and planes will be concentrated at New York, Boston, Philadelphia, Baltimore, Wilmington, Washington and other points along the East Coast in addition to several inland cities. The attack and defense by air of metropolitan centers will comprise a major part of the maneuvers. New York will be under siege during the last two weeks in May. Demonstrations will include aerial combat in which pursuit, observation and bombing planes will participate. A night bombing raid will be staged over the city on May 22. The Air Division will leave for New England on May 24, returning on May 26. Throughout the maneuvers, planes will be based at commercial as well as military airports.

These field exercises will have a threefold purpose: First, training and operation of a large number of units; second, unit combat training; and, third, supply, ground and combat problems.

A total of 250 military planes participated in the annual maneuvers of the Air Corps of 1930, which were based at Mather Field, Sacramento, Calif.

Navy to Test Planes for Gas Fumes

TESTS of each new type of naval aircraft for monoxide gas fumes escaping from exhaust into the cockpit will be conducted by the Bureau of Aeronautics, Navy Department, according to a recent announcement of officials of the Department. A portable recording device which indicates extremely low percentages of carbon monoxide in a volume of air will be employed in tests of planes in the future. This instrument has been developed by representatives of the Bureau of Aeronautics and the Mine Safety Appliances Company.

Designed to indicate the presence of this gas in amounts as small as .0002 per cent, the apparatus can be installed in such a manner as to give warning automatically when the amount of carbon monoxide reaches a dangerous percentage, by sounding a bell or lighting a signal lamp.

REAR ADMIRAL WILLIAM A. MOFFETT, commenting on the award of the Collier Trophy for the development of the Autogiro, said recently that the Navy Department is interested in the possibilities of the Autogiro and will conduct experiments to determine its adaptability to the needs of the Navy.

ORDERS for 2,700 parachute harness assemblies for the Army Air Corps were received recently by the Switlik Parachute and Equipment Company, Trenton, N. J., according to an announcement of company officials. In addition, the company received orders from the Navy Department for 750 belts and a quantity of miscellaneous materials.

Anti-Aircraft Mounts Tested—Gliders Replace Towed Targets

TESTS of the T2 and T3 75 mm. gun anti-aircraft mounts are being conducted at Fort Bragg, N. C., to determine their mobility and effectiveness. Firing tests on targets towed by airplanes were made to determine accuracy and the most efficient rate of fire, a Vickers director being used.

Tests were carried out, using gliders released from airplanes instead of towed targets. It is believed that the glider will behave more like an actual airplane and will be much more satisfactory than a towed target because the necessity of a long tow rope makes the behavior of the towed target sluggish.

Experiments to determine the speed at which the mounts could travel over varying road conditions and how they stood up under all conditions of travel were conducted.

Report Fokker Building High-Speed Low-Flying Monoplane for Air Corps

CONSTRUCTION of a streamlined low-wing all-metal monoplane to carry bombs and machine guns has been practically completed for the U. S. Army Air Corps by the Fokker Aircraft Corporation at the plant, Hasbrouck Heights, N. J., according to unofficial information recently made available. The ship is said to be designed primarily as a low-flying, ground-"strafing" unit to harry enemy positions and moving troops from heights below 500 feet. High speed is said to be approximately 200 miles per hour.

The plane will carry two persons. It is powered with a geared 650-horsepower Curtiss engine. Four machine guns are concealed in the wings with only their muzzles protruding. In addition, there will be two defensive machine guns, mounted on a scarf ring, which the observer in the rear cockpit may fire in almost any direction. Offensive armament includes approximately 500 pounds of bombs in ten units which can be released from the rear cockpit. The line of fire of the machine guns is outside the propeller arc. The guns are said to be controlled electrically and to be capable of firing independently or together.

Tests of the ship, according to reports, will be conducted at Teterboro Airport and at Wright Field, Dayton, Ohio.

Rosendahl Appointed Commander of New Navy Airship *Akron*

LIEUTENANT-COMMANDER CHARLES E. ROSENDAHL, former commanding officer of the *Los Angeles*, has been appointed commander of the new navy dirigible *Akron*, according to a recent announcement of the Navy Department. Construction of the airship by the Goodyear-Zeppelin Corporation has been practically completed at Akron, Ohio.

Trial flights of the *Akron* are scheduled to take place in July, conducted by the Navy Department with a crew expected to number eleven officers and 40 men. After passing the tests satisfactorily, the dirigible will be flown from Akron to the Naval Air Station, Lakehurst, N. J., and placed in commission.

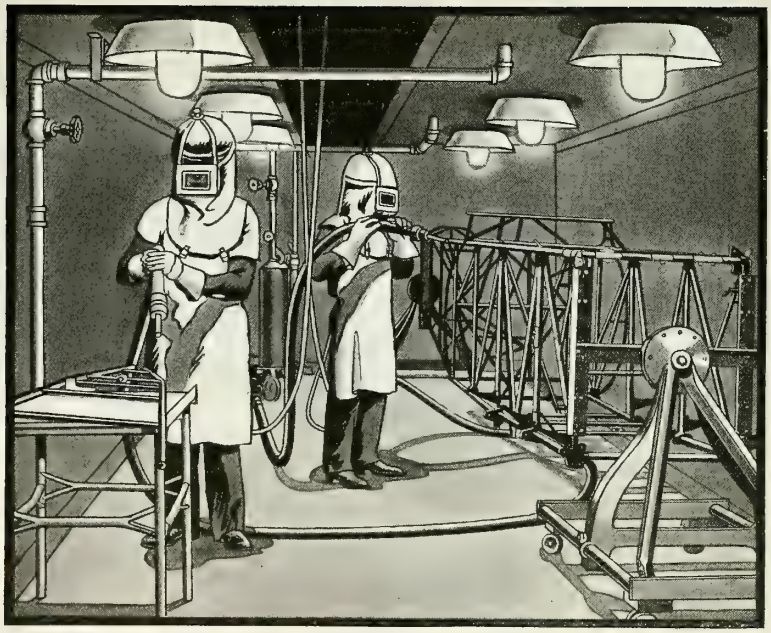
To Start Work on Navy's New Air Base at Sunnyvale, Calif.

CONSTRUCTION of the new lighter-than-air base at Sunnyvale, Calif., which will involve a total expenditure of $5,000,000, will probably be started about the middle of summer, according to information recently announced by the Navy Department. Bids for the erection of the airship shed, which will accommodate an airship with a capacity of 10,000,000 cubic feet, will be called for in about one month and specifications issued for the construction of other buildings at the base.

Negotiations for the 1,000 acres of land offered by the City of San Francisco are being constructed at present. Difficulties in searching of titles having been encountered, legal phases probably will extend the task of completing preliminary details for a few more weeks.

Construction of the airship shed is expected to take between 15 and 18 months, and the building should be ready for use by the time the second of the Navy's two new super-dirigibles will have been completed by the Goodyear-Zeppelin Corporation.

The ground plan for the station has been worked out. However, actual design work on the other structures to be built at the station has not been started yet. Construction of the industrial buildings, sewerage and water systems, and other facilities of the air station probably will not start until July 1, 1932.

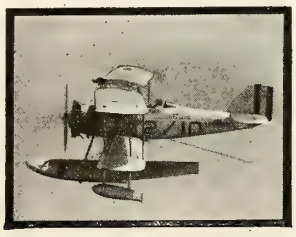


BUILDING CHANCE VOUGHT STAMINA INTO AIRPLANES

Metal parts on Chance Vought airplanes hold their finish. No landings in rough salt water—no dives through soaking clouds of rain—no penetrating fogs break through to start corrosion. Perched high on the exposed decks of Navy ships at sea, Vought planes are well protected against the lash of wind-blown spray.

Before the three protective coats of red oxide and enamel go on, the metal parts are cleaned and surfaced in the sandblasting room. Clouds of fine, sharp grains with a lusty pressure of air behind them remove every vestige of dirt and grease, producing a surface to which the finish hangs on through the toughest kind of service.

In the modern, sunlit Vought plant at East Hartford, you'll find the latest equipment and processes. And you will discover many ingenious methods and mechanisms which are as characteristically Vought as the ships themselves. Chance Vought Corporation, East Hartford, Connecticut. Division of United Aircraft & Transport Corporation.



CHANCE VOUGHT CORPORATION

Curtiss Demonstrates New Fighting Plane to Navy Department

OFFICIAL demonstration of the F9C by William Crosswell of the Curtiss Aeroplane and Motor Company was made recently at the U. S. Naval Air Station, Anacostia, D. C. The demonstration included a dive to terminal velocity, long spins, left and right, and all the fighting plane acrobatics.

The National Advisory Committee for Aeronautics furnished instruments used in calibrating the elements of the dive.

The Assistant Secretary of the Navy for Aeronautics, David S. Ingalls, flew the plane after the demonstration was over.

The F9C is the ninth of the series of Curtiss fighters and the latest model of the Fighter class produced by the company.

St. Louis Naval Air Reserve Squadron To Be Expanded in July

EXPANSION of the U. S. Reserve Air Squadron VN 12 RD9, stationed at the Naval Reserve Aviation Base, Lambert-St. Louis Field, Mo., to a full squadron containing a headquarters division and two combat divisions is scheduled in July. At that time three new "Hell Diver" two-place combat planes will be delivered to the squadron, augmenting the four N2C2 training planes which the unit now has.

A new hangar being constructed by the City of St. Louis for the Naval Reserve Base at a cost of $60,000 is nearing completion at the airport. The building, to be finished by July, will contain a floor space of 90 feet by 120 feet and one-story expansions along either side for offices, quarters for officers, machine shops and training quarters.

Lieut. Frank E. Weld is in command of the Naval Reserve Base and Lieut. J. F. Fisher is in command of the Reserve division.

Nine officers and twenty-one enlisted men of the Reserve Air Squadron recently started a two weeks' training course of active duty, including intensive training in all types of combat duty.

REGULATIONS ordering changes in the administration of the Naval Air Stations at Coco Solo, Canal Zone, and Pearl Harbor, Hawaii, have been issued by Charles Francis Adams, Secretary of the Navy. The order prescribes that control of these shore bases shall be taken over by the Commander in Chief of the United States Fleet, as is the case with aircraft squadrons based at shore stations in the United States, and their designation shall be changed from "Naval Air Stations" to "Fleet Air Bases." Changes in command of the aeronautical establishment of the Navy from commandants of naval districts to the Commander in Chief of the Fleet were ordered to take place April 1.

THE CHANCE VOUGHT CORPORATION recently demonstrated a special high-speed plane to the Navy Department and the Flight Test Section at Anacostia, D. C. No official figures are available on the new plane, a Vought Corsair, to be known as "Corsair II." It is reported to have a speed of approximately 190 miles per hour.

David S. Ingalls, Assistant Secretary of the Navy for Aeronautics, and Captain John H. Towers, Assistant Chief of the Bureau of Aeronautics, witnessed the demonstration at the air station. Mr. Ingalls flew the plane after the demonstration. The plane, an improved type Corsair, was designed by Chance Vought engineers in coöperation with the Bureau of Aeronautics of the Navy Department. It is powered with a supercharged 600-horsepower Pratt and Whitney Hornet engine which gives it a cruising speed of approximately 160 miles per hour.

THE 22ND OBSERVATION SQUADRON, stationed at Maxwell Field, Montgomery, Ala., moved to Fort Benning, Columbus, Ga., on April 2 to participate in a 30-day maneuver of all troops in the 4th Corps Area. The detachment, consisting of 60 enlisted men, 18 officers, 12 observation airplanes and one transport plane, stationed at the Fort Benning Landing Field, operated entirely from one point. The personnel camped in tents on the field. Captain Donald P. Muse, Air Corps, was in command. Additional Air Corps units taking part were a squadron each of Pursuit, Attack and Bombardment. The Bombardment Squadron, from Langley Field, Va., was stationed at and operated from Maxwell Field during the entire period.

THE PRESENT CLASS at the Air Corps Advanced Flying School at Kelly Field, Texas, began training on March 4. The class numbers 103 students, equally divided from March and Brooks Fields. Five officers of the Regular Army are members of the class: Major H. A. Strauss; First Lieutenants Charles P. Cabell and Robert C. Oliver; Second Lieutenants Roy H. Guertler and Harold Q. Huglin; three foreign officers, Captain Gerd von Massow (Germany), Captain Tomas M. Letona (Guatemala), and Captain Ricardo Rodas (Guatemala); 94 Flying Cadets; and one Staff Sergeant who is taking the training in grade.

The students are from 33 different states and two foreign countries California with eighteen and Texas with twelve lead in number of students from one state. The Attack Section has 18 students assigned to that specialty for training; the Bombardment Section has the same number; Observation has a total of 27, and Pursuit has 40.

AIR CORPS STUDIES DIRECTION FINDERS

THE Air Corps has been interested for some time in radio direction finding equipment for aircraft, according to a recent report of the organization's study of developments of this kind. A number of different methods have been investigated but none as yet completely fulfilled the requirements which it is believed an aircraft direction finder should have. However, there is every reason to believe that a satisfactory direction finder will be forthcoming in the near future, the Air Corps reports.

Four different methods are now under observation. The simplest system of direction finding is a coil of wire on the wings, or a "wing loop," connected to a receiver, and working in conjunction with the steady and constant signal of a transmitting station on the ground. The orientation of the "wing loop," and consequently of the coils, in the direction from which the strongest signals are received, gives to the pilot an indication of the bearing of the transmitting station.

Ten sets of equipment of this kind have been procured for test. Instead of using the audible signal in the head phones to obtain direction, small shielded meters are provided. One is mounted on the pilot's instrument board while the other is included in a box, which also contains means for tuning the "wing loop" and the necessary switches for using the standard aircraft receiver, type C-152, with either the "wing loop" or the trailing wire antenna. This box, which is mounted near the radio receiver, also contains a volume control and switches, which make it possible to use either the meters or phones.

Used with the BC-152 receiver, any station between 200 and 1,200 meters (1,500 and 250 kilocycles) may be used as a radio beacon. Broadcast stations of considerable power scattered all over the country may be used as radio beacons with this device.

The sytem of direction finding was used during the war and has been used to a considerable extent by the Navy.

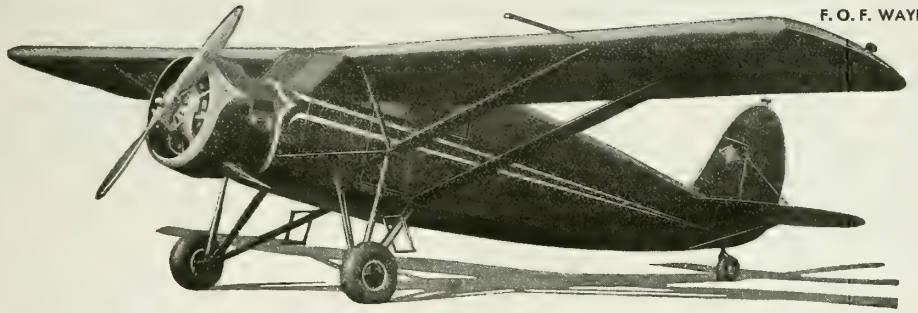
An improved system of this kind, which was developed under the direction of Herbert Hoover, Jr., for use by the Western Air Express, has been given preliminary tests by the Air Corps.

Two other aircraft direction finders have been under investigation by the Air Corps. One is known as the Eaton Direction Finder and the other is a development of one of the large commercial companies engaged in the design of electrical equipment. The Eaton Direction Finder, one of which has been procured by the Air Corps, uses a small loop which rotates in the slipstream, and has a compass card, with a needle which orients itself so as to point to the transmitting station. The bearing of any radio transmitter which can be tuned in on the receiver can be quickly determined. Difficulty in designing suitable mechanical parts free from appreciable friction is at present holding up this development.

The other direction finder referred to is undergoing test. It is a conventional radio direction finder, but due to excellent receiver design a very small loop can be used and its total weight and size make its installation in aircraft practicable. Its use in long-range observation aircraft will be especially desirable.

STINSON $4995

F. O. F. WAYNE, MICH.



215 H. P. 4-Passenger Cabin Plane, with the

World's Champion Motor

Lycoming motors in Stinson planes operated by the New York-Philadelphia-Washington Airways alone have flown 780,300 consecutive engine miles without failure of any sort—a record, we believe, never before approached.

THE WORLD'S LARGEST BUILDER OF CABIN PLANES

The company that builds more cabin planes than all others combined offers this 4-passenger Cabin Plane at $4995. This is why Stinson is the accepted standard of aircraft value. Because of Stinson's long experience, vast resources, tremendous purchasing power, and manufacturing facilities, Stinson was the first to make it possible to buy this type of plane for less than $10,000. Being a part of a group of industries with $50,000,000 in assets, it is self-evident why Stinson alone offers a superior product for less cost. The Stinson plane has 51 advantages found in no other plane. Why pay more and get less? We invite you to write us for a list of these advantages. Also, it is significant that products that come from the group of which Stinson is a part, once established in design, remain unchanged for a long period. It is our belief that the design of this Stinson plane will be standard for many years to come.

MEMBER AIRCRAFT MANUFACTURERS ASSOCIATION INC. LICENSED UNDER U. S. AIRPLANE PATENTS OF ALL MEMBERS

OTHER STINSON PLANES: Four Passenger, 300 H. P. Wasp — $8,995 • Stinson Airliner Eleven Passenger Tri-Motored Transport — $25,900 • Eight Passenger, Tri-Motored Executives' Model, prices upon request. • All prices F. O. F. Wayne, Michigan. Equipment other than standard, extra. Prices subject to change without notice. Stinson Aircraft Corporation, Wayne, Michigan. • Division Cord Corporation.

POWERED BY LYCOMING

AERONAUTICAL INDUSTRY

NATIONAL AIRCRAFT SHOW ATTENDANCE

MORE than 90,000 persons, 81,000 of whom paid admission, attended the National Aircraft Show of 1931, according to figures released recently by Ray Cooper, show manager. The show, held in the $1,000,000 hangar on Detroit City Airport, closed on April 19, after a nine-day run that marked it as one of the most successful events of its kind ever held.

Persons paying admission at the gate totaled 75,102. Tickets sold in books prior to the show's opening approximated 6,000, bringing the total paid admissions to 81,000. The remaining attendance included special guest invitations, press passes and passes issued to the show's 160 exhibitors. Approximately eighteen per cent of the total paid admissions were those of children under fourteen years of age.

Seventeen of the forty-one airplane manufacturers exhibiting at the show, in a check-up made by show officials on the closing day, reported orders for 636 airplanes valued at approximately $1,652,751. The remaining airplane exhibitors had no reports ready for publication. Due to the fact that there were 118 aircraft accessory exhibitors, no check was attempted in their case.

Perry A. Fellows, engineer-manager of Detroit City Airport, reported figures on air traffic on the airport during the show. Landings and take-offs on the airport's runways totaled 11,135. Exclusive of the large number of persons going aloft on demonstration hops, the total number of sightseeing passengers carried at the airport during the show totaled 5,384. The sum of $14,568 was collected by sightseeing operators on the airport, exclusive of $885 received from persons taken on aerial taxi hops between Detroit City Airport and other airports within the Detroit area.

A total of 505 pilots registered in the "arrival" column of the airport register during the nine days of the show. The peak hour of the entire period occurred between five and six p. m. on April 18, when 256 landings and take-offs were chalked up.

The Detroit show was sponsored jointly by the Aeronautical Chamber of Commerce of America, Inc., and the Aircraft Bureau, Detroit Board of Commerce.

THE SOCIETY OF AUTOMOTIVE ENGINEERS has awarded to T. P. Wright, chief engineer of the airplane division of the Curtiss Aeroplane and Motor Corporation, the Wright Brothers Medal, presented annually to the "author of the best paper on aerodynamics or structural theory or research, or airplane design or construction, which shall have been presented at a meeting of the society." The paper by Mr. Wright deals with "Development of a Safe Airplane—The Curtiss Tanager."

The Manley Memorial Medal, given annually by the S.A.E. to the "author of the best paper relating to theory or practice in the design or construction of, or research on, aeronautic powerplants or their parts or accessories," has been awarded to Dr. Oscar C. Bridgeman, Bureau of Standards. The subject of Mr. Bridgeman's paper was, "The Effect of Airplane Fuel Line Design on Vapor Lock."

PILOTS of aircraft landing on or taking off from beaches were requested recently by Gilbert G. Budwig, Director of Air Regulation of the Department of Commerce, to exercise extreme care in their operations in order that accidents to persons using the beaches may be prevented.

Aircraft should not be operated from beaches without suitable precautions being taken to warn the public through the use of flags, signs or other marking devices that the area so marked is dangerous and should be avoided by pedestrians and motorists, Mr. Budwig said. Itinerant landings on beaches frequented by the public and without prior and suitable notice that such landings are to be made, should not be undertaken. Failure of airmen landing on or operating from beaches to take precautionary measures for the benefit of the public, constitutes a violation of the Air Commerce Regulations.

H. Pitcairn Awarded Collier Trophy for Autogiro Development

THE COLLIER TROPHY AWARD of 1930 has been made by the National Aeronautic Association to Harold F. Pitcairn and associates for the development and application of the Autogiro. This award is made annually by the association "for the greatest achievement in aviation in America, the value of which has been demonstrated by actual use during the preceding year." Although there were many achievements in aviation during 1930, the Collier Trophy Committee of the N.A.A. was unanimous in its report that the development and application of the Autogiro was the most noteworthy.



(Acme-P. & A. Photo)
James Ray, received by President Hoover after landing Autogiro on White House lawn

Mr. Pitcairn first witnessed an Autogiro flight in Spain in 1925. He completed in 1928 negotiations with Juan de la Cierva, inventor, for the American rights. Since that time, constant improvement has been effected at the Pitcairn factory. Numerous cross-country and demonstration flights have been completed; an Autogiro has been purchased by the *Detroit News* for use in news gathering, and the United States Navy Department acquired one of the craft for experimental purposes.

The committee announced that the Autogiro permits flying performance hitherto impossible; take-off at low speed after a short run and immediately assume a sharp climbing angle; a high speed over 100 miles per hour and a landing speed as low as twenty-five miles per hour; come momentarily to a standstill and hover, and descend vertically at speed less than that of a parachute descent.

LIST NATIONAL AIR RACE EVENTS

THE schedule of events in the National Air Races of 1931, to be held at Cleveland Airport, Cleveland, Ohio, August 29-September 7, was announced recently by the National Air Races of Cleveland, Inc., sponsors. A total of $100,000 in cash prizes in addition to trophies will be awarded the winners of the various events. The National Air Races this year are the eleventh of this annual American aviation classic.

There will be a total of 39 scheduled events in addition to special contests. There will be three prizes in each event. A transcontinental free-for-all derby from some Western city to Cleveland has been included on the program. Landings may be made or the flight may be non-stop. Any type of plane or engine may be used. The total purse for this event is $10,000. There will be in addition a handicap men's derby and a handicap women's derby, each having a purse of $6,000. Airplane speed contests will include the Thompson Trophy Race open to men pilots only, with a purse of $15,000 and gold, silver and bronze plaques of the trophy; and the Cleveland Pneumatic Aerol Trophy Race, open to women pilots only, with a purse of $7,500.

In addition, there will be dead stick landing, balloon bursting and parachute jumping contests, an air transport speed and efficiency contest, closed course and straightaway speed contests and special events.

DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

In recognition of his high altitude photographic achievements in 1929, Capt. A. W. Stevens, chief of the aerial photographic unit of the Army Air Corps, Wright Field, Dayton, Ohio, was presented with a gold medal symbolic of his having the MacKay Trophy. (March 31).

(France.) Jean Mermoz and Antoine Pillard, French pilots, broke the world's non-refueling record for endurance flying in a closed circuit, covering more than 5,679 miles in 59 hours and 14 minutes. (April 2.)

(France.) Capt. Frank M. Hawks, American pilot, flew from Cherbourg to Paris in 56 minutes in his Travel Air Mystery S monoplane *Texaco* 13. (April 5.)

(South Africa.) A new record of six days and ten hours for a flight from London to Cape Town was completed by Lieut.-Comdr. Glenn Kidston in his American-built Lockheed Vega monoplane, exceeding the previous record of eight and one-half days established by Lieutenant Caspareuthus. (April 6.)

An unofficial altitude record for an Autogiro of 19,000 feet was established by Amelia Earhart at Pitcairn Field, Willow Grove, Pa. (April 8.)

Lieutenant-Commander Charles E. Rosendahl was appointed commander of the new navy dirigible *Akron*. He will assemble a crew for trial flights scheduled in July. (April 8.)

(Germany.) The *Graf Zeppelin* left Friedrichshafen on an African and Near East cruise with the first landing scheduled at Cairo, Egypt, the second German Zeppelin to fly over Africa. (April 9.)

(France.) Two French pilots, Froton and Lavergne, set new records for duration and distance over a closed circuit for light two-place planes, flying for 29 hours, 38 minutes and 45 seconds, covering 2,153 miles. Their flight was made from the Istres flying field near Marseilles. The records were previously held by the Italian Donati. (April 9.)

(Australia.) C. W. Scott broke Wing Commander Charles Kingsford-Smith's record for a flight from England to Australia, setting a new mark of nine days, four hours and eleven minutes. He landed at Port Darwin on the last lap of the flight from Sumatra. (April 10.)

The International Aircraft Show was held in the large hangar at the Detroit City Airport, Detroit, Mich., sponsored by the Aeronautical Chamber of Commerce and the Aircraft Bureau, Detroit Board of Commerce. (April 11-19.)

Ruth Nichols established a new international speed record for women of 210.685 miles per hour on a flight over a three-kiliometer course at Grosse Ile Airport, Detroit, Mich., breaking the former record of 181.157 miles per hour set by Amelia Earhart. The fastest previous time made by a woman pilot was the unofficial record of 196 miles per hour held by Florence Loew Barnes. Miss Nichols used the Lockheed Vega monoplane in which she established transcontinental and altitude records. (April 13.)

On a flight from New Castle, Dela., to Roosevelt Field, L. I., in a Bellanca monoplane, Holger Hoirlis, Danish flier, piloted his plane by means of instruments entirely while in the air, flying "blind" in an enclosed cabin with the exception of taking off and landing. (April 14.)

Walter Lees and Frederick Brossy, attempting to establish a new international non-refueling endurance record in a Diesel-powered Bellanca monoplane at Jacksonville Beach, Fla., were forced to land because of inclement weather after remaining in the air for 74 hours, approximately two hours less than the world's record. (April 15.)

Twenty-four hour air mail and express service between New York City and Los Angeles, Calif., was inaugurated by Transcontinental and Western Air. (April 20.)

(England.) Capt. Frank M. Hawks, American Pilot, set a new record for a London-Rome flight but was forced down by bad weather near Paris on the return flight to establish a round-trip record. Using the Travel Air Mystery S monoplane *Texaco* 13, Captain Hawks flew the 900 miles from London to Rome in five hours and 26 minutes at an average speed of 167 miles per hour, exceeding the former record of 12.5 hours held by Wing Commander Charles Kingsford-Smith. (April 22.)

James G. Ray, vice president of the Pitcairn Autogiro Company, landed and took off in an Autogiro on the White House grounds, Washington, D. C., witnessed by President Hoover, other Government officials and aviation representatives. The demonstration was given in connection with the ceremony at which President Hoover presented the Collier Trophy to Harold F. Pitcairn and his associates. The Trophy, awarded annually by the National Aeronautic Association for the greatest achievement in American aviation during the preceding year, was awarded to Mr. Pitcairn and associates for the development and application of the Autogiro. (April 22.)

Dr. Kimball Honored for Services in Advising Transatlantic Pilots

MANY of the world's leading pilots attended the recent dinner held in New York in honor of Dr. James H. Kimball, meteorologist of the New York Weather Bureau, in recognition of the services rendered in advising fliers before taking off on their long-distance flights as to weather conditions which they would encounter ahead.

In the accompanying photograph are, left to right, front row—Clarence Chamberlin, Amelia Earhart, Dr. James H. Kimball, Ruth Elder, Peter J. Brady, and Col. James Fitzmaurice; back row—Lewis Yancy, Col. Charles A. Lindbergh, Col. Frank Courtney, Armand Lotti, Harry Connor and Bert Balchen. All of the pilots in the group flew the Atlantic.



(Acme Photo)

Prominent pilots honor Dr. James H. Kimball for aid in transatlantic flying

MAKING AMATEUR AERIAL MOVIES

AMATEUR movie makers who wish to make pictures from the air are given a number of suggestions by Charles Ford, editor of the Chicago *Daily News*-Universal Screen Service and authority on aerial movie making, in an interview released by the Bell & Howell Company, manufacturers of photographic equipment.

Mr. Ford's first suggestion is that the amateur photographers use a panchromatic film and an aero filter. Regular films will not get satisfactory pictures if there is any haze or smoke. The filter, which necessitates increasing the exposure, is an important adjunct in haze penetration. A 2x filter, which requires doubling the exposure, is recommended for pictures over land, and a 6x over water.

Ordinary aerial work, Mr. Ford said, particularly from considerable heights, requires smaller diaphragm openings than does ground work. In view of the fact that there is so much variation in atmospheric and light conditions, and in altitude and terrain, the use of an exposure meter is recommended. In making his own movies, Mr. Ford tapes the diaphragm ring in position, once he has decided on the best stop to use, so that it will not be shifted by vibration.

The light and atmospheric conditions are best for aerial work between 9:30 a. m. and 3:30 p. m. Angling light, however, is better than the overhead light of noon.

The consideration of altitude is closely related to that of camera angle and camera speed. The higher the photographer is, the more use he will have for a telephoto lens.



The smaller the area taken in by the lens the more likely he is to get blurred pictures if the camera is pointed straight down.

Double camera speed is recommended for aerial work, as it minimizes the effect of the plane's vibration. The pictures should be shot through an open window, but with the camera inside as it is difficult to hold it steady enough if it is held outside the window.

Mr. Ford suggests that the movie makers film a complete story of the trip, rather than only views of the earth. The plane, the attendants, the passengers and all elements of the air trip will add interest to the completed film when it is run off for friends.

Chance Vought Employees Organize Social and Sport Club

THE Chance Vought Club, made up of employees of Chance Vought Corporation, East Hartford, Conn., was recently organized at a general meeting of the employees.

This club will be the center of all employee activities, committees being formed to handle each activity. It is planned to immediately form baseball and soccer teams to represent the company in the industrial leagues, and to provide facilities for handball. At later dates bowling, basketball and other sports will be taken up. It is intended to organize a company orchestra and choral club.

The following officers were elected for the remainder of the year: William Irwin, president; Peter Beck, vice president; Joseph Mooney vice president; Helen Claffey, secretary; and E. E. Norin, treasurer.

The following committee chairmen were elected: J. F. Griffin, membership; Fred Lauer, house; August Schumacher, entertainment; George Franko, athletic.

AIRCRAFT flying over Federal or State penal institutions will be required to maintain an altitude of at least 1,000 feet, under an amendment to the Air Traffic Rules of the Air Commerce Regulations, announced recently by Gilbert G. Budwig, Director of Air Regulations, Department of Commerce. The amendment applies to all aircraft and under all circumstances except where necessary incident to taking off from or landing on an established landing field, airport or on property designated for that purpose by the owner.

Air Commerce Violations for First Quarter Totaled 313

VIOLATIONS of the Air Commerce Regulations during the first quarter of 1931 totaled 313, according to a recent announcement of Gilbert G. Budwig, Director of Air Regulation. The total violations for this period represented an increase of 46 over the last quarter of 1930 and the total number of persons assessed increased 26.

Fines totaling $290 were assessed against and collected from 65 persons in the first quarter. Penalties in the form of 56 reprimands, 84 suspensions, 25 revocations and seven denials of licenses were meted out for the violations. In 76 cases, evidence produced justified dismissal.

Violations of the Air Commerce Regulations dealing with acrobatics led the list of specific offenses. There were 60 violations of the acrobatics provisions, and 40 of the low-flying clause of the regulations. Other specific violations during the first quarter of 1931 were: Unlicensed pilot flying licensed plane, 23; flying without navigation lights, 10; flying without identification numbers, six. The miscellaneous offenses numbered 174. Of the total number of violations, 37 are pending.

Revise Approved School Requirements

REVISION of the requirements of the Department of Commerce which shall be met by civilian schools giving flying instruction to be eligible as approved schools were announced recently by officials of the Aeronautics Branch. The revised requirements do not make it necessary for a student to complete a course in a given amount of time nor do they stipulate what per cent of the enrolled students should be graduated. In addition, it is now permissable for a student to count two hours dual cross country as a portion of his dual and check time toward his total flying time.

The requirement was added that ground schools not providing flight instruction shall be required to affiliate or make suitable arrangements with an approved flying school to provide necessary flight instruction before they will be eligible for approval.

The revised requirements are published as Aeronautical Bulletin 7-B, "School Supplement of Air Commerce Regulations."

OPERATING COSTS OF ARROW PURSUIT AND SPORT TRAINER

DATA on the operating costs of the Arrow Pursuit and the Arrow Sport Trainer were announced recently by officials of the Arrow Aircraft & Motors Corporation, Lincoln, Neb. Using five ships of each model, the company compiled figures on the operating expenses of these ships over a period of one year. It was found that the average cost per mile for flying the Pursuit, powered with a 100-horsepower Kinner engine, was 6.3 cents; and for the Sport Trainer, powered with a 65-horsepower LeBlond engine, 5.7 cents. These cost estimates for both models were based on fifty hours flying time per month.

The operating costs for the Arrow Pursuit, figured on an hourly basis, was as follows:

Gasoline—8 gal. per hour @ 22c	$1.76
Oil—3 gal. in 25 hours @ 85c	.12
Maintenance and ordinary repairs	.40
Major overhaul—$200 in 300 hours	.66
Depreciation—33 1-3 per cent on $3,500 less estimated salvage of $800	1.50
Taxes—2 per cent	.11
Insurance—fire, all causes, windstorm, public liability and property damage	1.00
Contingent items—10 per cent	.58
Hangar—$10 per month	.20
Total direct operating cost	$6.33

The Arrow Pursuit has a cruising speed of 100 miles per hour at 1,700 revolutions per minute.

The operating costs for the Arrow Sport, figured on an hourly basis, were as follows:

Gasoline—4.5 gal. per hour @ 22c	$ .99
Oil—2.5 gal. in 25 hours @ 85c	.08
Maintenance and ordinary repairs	.30
Major overhaul—$150 in 300 hours	.50
Depreciation—33 1-3 per cent on $2,700 less estimated salvage of $400	1.23
Taxes—2 per cent	.09
Insurance—fire, all causes, windstorm, public liability and property damage	1.00
Contingent items—10 per cent	.45
Hangar—$10 per month	.20
Total direct operating cost	$4.84

The Arrow Sport Trainer has a cruising speed of 86 miles per hour at 1,800 revolutions per minute.

COMING AERONAUTICAL EVENTS

May. Annual maneuvers of Army Air Corps along Atlantic Seaboard. (See page 96.)

May 8-10. Air meet, auspices Binghamton Airport Company and Binghamton Chamber of Commerce, Binghamton, N. Y.

May 8. Air Circus, Everett, Wash., Airport.

May 12-14. Fifth National Technical Aeronautical Meetings, A. S. M. E., Baltimore, Md., sponsored by Engineers' Club of Baltimore.

May 15-31. International Aero Exhibition, Stockholm, Sweden.

May 15-17. Omaha Air Races, Omaha, Neb.

May 15-21. Aeronautical Industrial and Commercial Exposition, Balbuena Field, Mexico City, Mexico, postponed from May 1-10.

May 23. Dedication of Floyd Bennett Field, New York, N. Y.

May 30-June 1. Dedication of the Municipal Airport, Birmingham, Ala., auspices of Chamber of Commerce and Junior Chamber of Commerce.

June. First Annual Aviation Country Clubs Seaplane Cruise, sponsored by Amateur Air Pilots Association, on Atlantic Coast.

June 6-14. Meeting of Federation Aeronautique Internationale, Bucharest.

June 18-27. Third Annual Michigan Air Tour, sponsored by Grand Rapids, Mich., starting and ending at Grand Rapids.

June 20-21. Dedication of Baton Rouge Airport, Baton Rouge, La.

July 4-25. Tentative date of the National Air Tour of 1931 for the Edsel Ford Trophy, starting and ending at Detroit, Mich.

August 29-September 7. National Air Races, Cleveland, Ohio.

September 12. Schneider Trophy Race over the Solent and Spithead course, Southampton, England.

PROGRAM OF A.S.M.E. BALTIMORE MEETING

A TECHNICAL program of more than fifty papers has been arranged by the Aeronautic Division of the American Society of Mechanical Engineers for its Fifth National Aeronautic Meeting, to be held May 12-14 at the Lord Baltimore Hotel and Engineers' Club, Baltimore, Md., sponsored by the local section of the society and the Engineers' Club and affiliated societies.

The program of the meeting is as follows:

MAY 12

Operating Session

An Analysis of Various Airplane Types for Transport Uses, by Capt. F. T. Courtney.
Maintenance of Equipment in Air Transport Operation, by Lester D. Seymour.
Aircraft Servicing Problems, by Charles Froesch.

Design Session

Design and Possibilities of the Light Airplane, by J. Henry Reisner.
Airplane Design in Relation to Tactical Requirements, by Temple N. Joyce.
Weight Control in Airplane Design, by Wm. P. McKinnie.

Engine Session

Analysis of Aircraft Engine Design, by Harold Caminez.
Progress in Design of Engines for Light Airplanes, by Henry Lowe Brownback.
Engines for Light Airplanes, by Otto E. Szekely.
Two Cycle Aircraft Engine, by J. H. Geisse.

Airport and Management Session

Airports for Small Cities, by E. L. Wheless.
Engineering Essentials for Airport Enclosures, by Capt. Fred'k Schauss.
Discussion of Architectural Principles Applied to Airport Design, by Prof. H. V. Walsh.
Business Aspects of Aviation, by A. A. Bigelow.
Cost of Operating a Business Airplane, by Jerome Lederer.

Construction and Materials Session

Special Methods of Testing Aircraft Materials, by D. M. Warner.
Plywood in Aircraft, by Geo. L. Fisher.
Types of Design and Their Effect on the Structural Design of Airplanes, by F. S. Hubbard.

Engine Session

Supercharging the Engine and Increasing the Speed with Altitude, by Robert J. Nebesar.
Altitude Laboratory Tests of Aircraft Engines, by H. K. Cummings and E. A. Garlock.
Some Observations on Aircraft Engine Testing Laboratories, by R. N. Dubois.
Junkers Aero Diesel Engine Type FO-4, by Junkers Research Institute.

Evening, General Session

The Aviation Lessons of the Antarctic Expedition, by Lt. Bernt Balchen.

MAY 13

Plant Inspection Trips

Martin and B-J plants or the Bureau of Standards, Washington, D. C.

Metal Construction Session

Construction of the Metal Airplane, by Geo H. Prudden.
Some Effects of Corrosion-Fatigue on Streamline Wire of Airplanes, by Lt. H. E. Haven.
The Cause and Prevention of Heat Cracks in Aircraft Welding, by H. S. George.

Propeller Session

Racing Propellers for Light Airplanes, by Fred E. Weick.
Magnesium and Hollow Steel Propellers, by G. T. Lampton.
The Value of Controllable Pitch Propellers, by W. B. Heinz.
Controllable Pitch Propellers, by Frank W. Caldwell.

Training and Navigation Session

Vocational Training in Aviation, by Frank Cushman.
Modern Flight Training, by Major W. D. Tipton.
The Aviation Course at the Naval Academy, by Lt. Comm. D. A. Ramsey.
The Ice Hazard on Airplanes, by Dr. William C. Geer.

Evening Banquet

MAY 14

Aerodynamic Session

Control at Low Speed, by Lt. Carl Harper.
A Study of Stabilizer Beam Loadings in a Dive and During a Sudden Pull-Up, by W. H. Miller.
Tail Spinning of Aircraft, by G. G. Budwig.
Decrease of Disturbed Motion in the Flight of an Airplane, by M. Louis Breguet.

Engine Session

Development of Wing Radiators, by G. A. Luburg.
Engine Ring Cowls, by W. H. Evers.
Engine Ring Cowls, by Mr. Boyd.
Observations on the Development of the English High-Speed Oil Engines from Submarine to Airship R.101, by Alan E. L. Chorlton.

Instrument Session

Instrument Flying and Its Teaching, by Maj. W. C. Ocker and Lt. Carl J. Crane.
Performance of Aneroid Altimeters for Landing and for Level Flying, by Dr. W. G. Brombacher.
The Sonic Altimeter, by C. W. Rice.
The Directional Gyro, by E. A. Sperry, Jr.

Communication Session

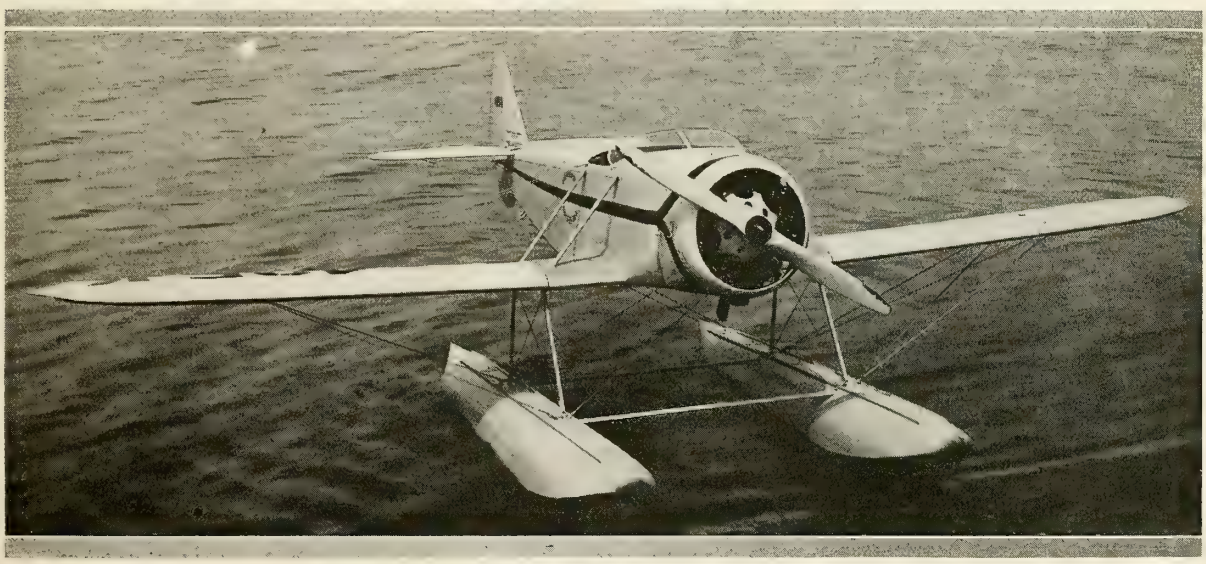
Radio Methods for Flying and Landing Airplanes in Fog, by H. Diamond and F. W. Dunmore.
Transmission of Visible Infra-red and Ultra-violet Radiations Through Fog with Reference to Developing Aids in Fog Flying by S. Herbert Anderson.
Discussion on the Effect of Lightning on the Airplane, by A. O. Austin.
Discussion of Airways Communication, by Geo. G. Breed, Eugene Sibley, H. A. Elliott.

Airship Session

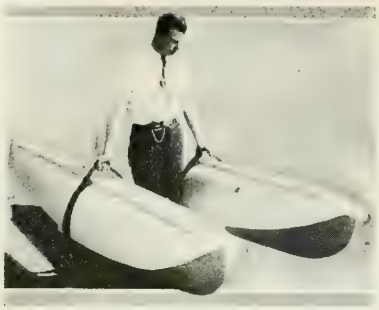
The Mooring and Ground Handling of a Rigid Airship, by Commander C. E. Rosendahl.
Water Recovery Apparatus for Airships, by Charles P. Burgess.
Some Thoughts on Stresses in Rigid Airships from a Different Point of View, by W. Watters Pagon.
Technical Problems in Airship Design, by W. A. Klikoff.

General Session

The S-Rotor, by S. Savonius.
Autogiro Rotor, by Heraclio Alfaro.



Paramount Sportster two-place seaplane equipped with Aircraft Products floats and powered with a Warner engine of 110 horsepower



Pontoons developed by Aircraft Products

PONTOONS weighing 37 pounds each have been developed by Aircraft Products Corporation of Detroit, for use on the Buhl Bull Pup, the Aeronca and other light planes.

The installation of these floats is simplified by eliminating the necessity for cross braces. This is accomplished by building the structure into the pontoon at the point of attachment, so that the load is carried to the very center of the pontoon. This takes care of the turning moment of the float. Absence of the cross bars reduces water resistance in taking off, and lowers head resistance in the air.

The pontoons are streamlined, decreasing the speed of the plane only slightly. Mahogany and duralumin alloys are used in the structure.

A detachable nose is substituted for the usual rubber or leather bumper for purposes of economy and may be removed for repair or replacement.

New Vought Commercial Ship Has High Speed of 190 Miles Per Hour

A NEW VOUGHT plane, designated as the Model V-50 Corsair, has been completed at the Chance Vought Corporation plant at East Hartford, Conn., according to a recent announcement of company officials. In official tests a high speed of more than 190 miles per hour and a cruising speed of 165 miles per hour were developed.

This new ship, developed for Executive travel, and to be used by executives of the Vought company, is powered with a Pratt & Whitney 600 horsepower supercharged Hornet engine. In essentials the plane is similar to the line of Vought Corsairs now in this country's air services and in foreign lands. However, it incorporates many modifications and improvements designed to increase its serviceability and performance, including streamlining throughout, a new type of engine cowling and wheel fairings. The ship is convertible into a seaplane by the interchange of floats for the wheel-type landing gear. The ship is a two-plane open-cockpit biplane. While it is of the open-cockpit type, it may be equipped with a demountable cabin over the cockpit.

The Model V-50 Corsair has as its basic structure the steel tube fuselage and wing cellule of the series of Vought Corsairs.

A NEW field of usefulness has been developed for the utilization of drawn metal sections in the modern airplane, with a result that manufacturers of planes are saving on their total cost by using such special items, according to officials of the Aircraft Products Corporation, Detroit, Mich. The company has been developing the Marchant patents for fabricating drawn metal sections. As many as twelve separate parts of the modern airplane wing or fuselage are made on a single machine, and may be produced at low cost in quantity. These include wing ribs, aileron sections, turtle deck fairing, compression members and butt ribs. It has been estimated that 40 per cent of the modern airplane consists of major essential parts which may be made in quantity production with its resultant economy.

The company manufactures pontoons, shock absorbers, wheel and brake units, tail wheel units, skis and skiwheels.

TWO new gage models have been developed by the Taft-Peirce Manufacturing Company, Woonsocket, R. I. One is an adjustable flat plug gage for measuring large internal diameters, and the other is an adjustable snap gage for checking shoulder work.



Public address horn used with planes

THE RACON ELECTRIC COMPANY, INC., New York City, has completed two new public address horns for use with airplanes. Both the two-unit six-foot trumpet and the nine-unit horn are designed for use where long-range projection is desired.

The six-foot horn is bell-shaped, thirty inches around and sixty-four inches long. It is storm proofed, has a metal beaded edge, cast aluminum throat section, and loose couplings for units. It is demountable and is equipped to operate with two giant units. The weight is twenty-three pounds.

The nine-unit horn is also bell-shaped and is of the same dimensions and the same general specifications as the two-unit. This horn, however, is equipped to operate with nine giant units and has a three-mile projection capacity. The weight is forty-eight pounds.

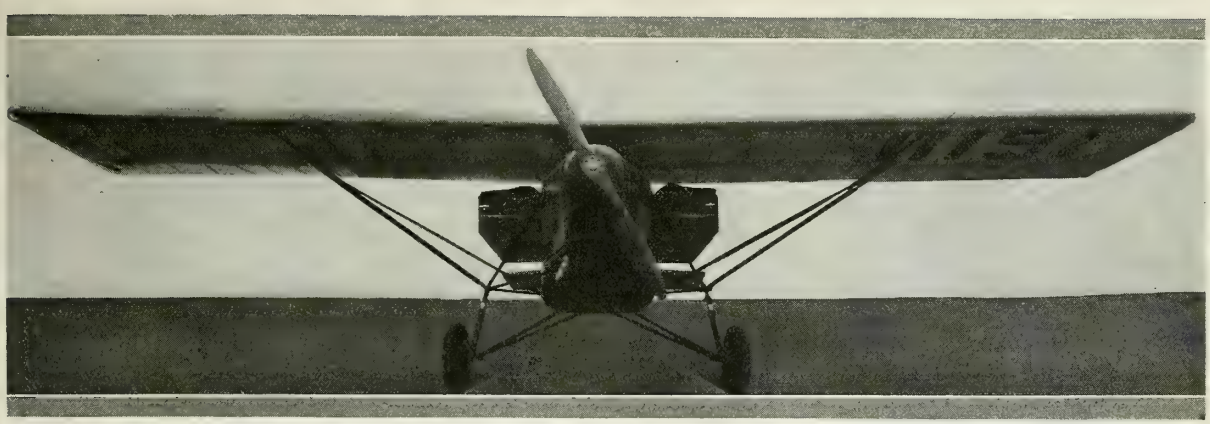
Haskelite at Air Show

THE Haskelite Manufacturing Corporation, producers of aircraft plywood, was the only plywood exhibitor at the National Aircraft Show, Detroit, April 11-19, according to a recent report of Haskelite officials. The company displayed wing ribs, spar sections and cabin lining panels, illustrating some of the uses of Haskelite and Plymetl.

An investigation of the planes on exhibition, conducted by the company, showed that eighty-five per cent used Haskelite or Plymetl, according to company officials. Haskelite was used in wing, cabin and tail construction. Plymetl was featured as cabin lining.



Model V-50 Vought Corsair powered with a Pratt & Whitney 600-horsepower supercharged Hornet engine



The Cain side-by-side two-seater parasol-type monoplane powered with a 95-horsepower Cirrus engine

THE CAIN TWO-SEATER MONOPLANE

By H. W. CAIN

FOR the past four years I have been surveying and analyzing the airplane market with the idea of finding out what is offering the most sales resistance to the airplane. My observations were made from the point of view of an operator of a flying school and passenger hopping business, from the point of view of a salesman trying to make the airplane he had to sell appeal to the public, and from the point of view of an individual who is financially able to buy an airplane, but who must be convinced that the airplane has been made a desirable thing to own. From these observations it becomes apparent that the first thing that offers sales resistance is the price, but that a second and even more important consideration is the expenditure of money and time necessary to learn to fly the average airplane.

Almost every manufacturer of airplanes realizes the price resistance but they seem inclined to overlook the latter consideration. It seems to be the tendency of manufacturers to build an airplane that will out-perform its competitors. Outstanding performance is an attractive feature, especially when selling to an experienced pilot, but it is about time the industry realizes that we must build an airplane that will appeal and sell to the average person who can drive a moderately-priced automobile. Before this type of person will buy an airplane he must see or feel that he will derive some benefit from the airplane, either in pleasure or business. In order to make flying a pleasure, the airplane must be made easy to fly, because the average person is either employed or has other interests that permit him only a few hours a week for flying. With such limited time it is impossible to get the experience necessary to make the average person confident of himself in the average type airplane.

With this in mind we have built an airplane that will virtually fly itself. This airplane is conventional in design. The large wing surface reduces the landing speed to approximately 35 miles per hour and the high speed to approximately 110 miles per hour.

Two large doors, one on each side of the cockpit, and the side-by-side seating arrangement make it as acceptable as an automobile. All the mechanism of the control system is concealed below the floorboards, with only a stick and pedals extending through, similar to the gear-shift lever and clutch and brake pedals of an automobile. All the controls have been pushed forward so that when the ship is on the ground and the flipper hanging down there is fifteen inches of clear floor space between the seat and stick. The controls are removable so that non-flying passengers can be carried. The stabilizer control is a little knob extending below the seat cushion in the center of the ship, convenient and easy to operate from either side of the airplane. The brakes are controlled by two heel pedals just below the rudder pedals on the left side.

The cockpit is completely and neatly upholstered. The instrument panel is in unit form, such as that of an automobile, and includes air speed, altimeter, tachometer, oil, temperature and pressure gauges, ignition switch, carburetor mixture control and throttle. The floor is covered with a carpet trimmed with the cockpit upholstering.

The cowling resembles in appearance the hood of an automobile, the top piece being held down by four spring hood fasteners, the bottom piece being held in position by four concealed spring hood fasteners. The side pedals hook into the lower panel and are held in place by exposed spring hood fasteners. The type of cowling used makes the motor easily accessible. In fact, the entire hood can be removed in less than a minute, leaving only the nose piece, which is fastened securely to the motor mount.

The fuselage is of the conventional steel tubing Warren truss type, covered with fabric to the firewall. The standard color is a deep blue, with a lighter shade of blue on the rudder and fin, hub caps and propeller. The fuselage also carries an aluminum belt line set on the thrust line. This belt line adds quite a bit to the cleanness of the fuselage, and helps to break up the broad side. The wings, stabilizer, and elevators are of a deep orange color. This color combination is not only attractive but can be discerned at a great distance.

The 36 gallons of gas which may be carried give a cruising range of approximately 550 miles.

The wing construction is conventional, having metal ribs, solid wood spars, and double drag trusses. The ailerons have an unusually wide chord; they are so designed to make ample aileron control far below the stalling speed. The aileron controls are enclosed in the wings with a zipper patch to make them accessible.

The landing gear has a wide tread and is of the heat treated steel tubing type, with dural fairing secured by Johnston wraplock. The wheels, brakes and shock struts are of our own design. The wheels are made to take a 6.50 by 10 air wheel. They are of sheet steel stampings and the brake is of the external contracting type. The wheels and brakes are light and unusually satisfactory, both from the standpoint of service and ease of operation. The shock strut is of the hydraulic type and has a travel a little longer than the average. The tail skid is of the cantilever spring type, and the bracket is made to take a tail wheel if desired.

This airplane is powered with a 95-horsepower Cirrus Hi-Drive engine, which gives good performance even though the ship has 193 square feet of wing surface.

A RECENT modification of policy by the Aeronautics Branch, Department of Commerce, permits manufacturers or operators of aircraft which have been previously approved without auxiliary cowling over the engine, to install such equipment without submitting drawings to the Department, and without submitting the airplane for flight test.



(Acme Photo)
Major James Doolittle awarded the Harmon Trophy for blind flying experiments in 1929

Sportsmen Pilot's Race

THE Second Annual Sportsman Pilot's Race of the Aero Club of Pennsylvania, will be held May 10. Twenty-five entries have been received. The race will be flown over a triangular course about 122 miles in length, starting at Patco Field, Norristown to Allentown Airport to Coatesville Airport and return to Patco.

The race will be a handicap event. Ships will be handicapped on actual top speed determined by a disinterested pilot in a test over U. S. Navy's test mile at League Island, Philadelphia. Each ship will leave Patco Field with handicap for the entire course and the first ship crossing the finish-line will be the winner. Trophies are being offered by the Aero club for the first three pilots to finish and a special trophy will be given the first woman pilot to complete the course. The race will be flown non-stop and the turning points will be pylons at each field.

Parks Regains Control of Parks Air College at East St. Louis

OLIVER L. PARKS, founder of Parks Air College, East St. Louis, Ill., has again assumed complete control of the school with the purchase of a great majority of the stock held by the Detroit Aircraft Corporation, according to a recent announcement. The Detroit company will retain about 25,000 shares. Mr. Parks arranged to take 103,998 shares, of which 69,998 shares will be retained by him and 17,000 shares by the personnel at the school.

OFFICERS OF THE EARLY BIRDS elected at the annual meeting of the organization are as follows, according to a recent announcement: Commodore F. G. Ericson, president; Commander J. Lansing Callan, first vice president; Major T. DeWitt Milling, second vice president; Albert B. Lambert, third vice president; Colonel John R. Sutton, treasurer; Ernest Jones, secretary, and L. A. Vilas, trustee (1935).

Chairmen of the various committees are as follows: Beckwith Havens, membership; Waldo D. Waterman, historical; Grover C. Loening, trophy; Augustus Post, resolutions; Richard H. Depew, Jr., reunion; Col. John R. Sutton, finance; B. Russell Shaw, welfare; Dr. H. W. Walden, auditing, and Frank Schober, insignia.

CAPTAIN Frank M. Hawks has been awarded the 1930 Trophy of the Ligue Internationale des Aviateurs, according to a recent announcement of Colonel C. W. Kerwood, executive vice president of the American Section of the Ligue. The Ligue's 1930 Ace of All Aces award, which carries with it a cash prize of 50,000 francs, has been given to Major Dieudonne Coste.

Make Tentative Plans for Third Annual Michigan Air Tour

PRELIMINARY plans of the Third Annual Michigan Air Tour were announced recently by the management. Sponsored by Grand Rapids, Mich., the tour will start June 18 at Grand Rapids and return to the starting point on June 27, following an itinerary which will cover the upper and lower peninsulas of the state.

Two stops per day are planned. Government officials will be invited to attend the tour and pay passengers will be carried by participating planes.

There were forty-five planes in the 1929 tour and forty-eight planes in the 1930 tour.

THE Universal aviation school at St. Louis has been purchased by Capt. R. D. Hughes and will be operated by him as a Government approved transport, limited commercial, private and ground school.

Chamberlin Flying Service Formed

CHARTER for the Chamberlin Flying Service was filed April 7 at Trenton, N. J. The company was organized by Colonel Clarence D. Chamberlin as a sales and service corporation for the new two- and eight-place Chamberlin planes now manufactured at Jersey City. In addition to a general flying service the company will maintain a consulting service for airports, schools, air lines, and other manufacturers. The officers are: Colonel Clarence D. Chamberlin, president; William A. Hartig, vice president; and Deane S. Hazen, secretary and treasurer.

NEW YORK

Binghamton Air Meet

PROGRAM of the Binghamton Air Meet and Show, scheduled at Binghamton Airport, Chenango Bridge, N. Y., May 8-10, was announced recently by the Binghamton Airport Company, sponsor of the meet in conjunction with the Binghamton Chamber of Commerce. The events will comprise an exhibition and demonstration of planes, and aerial contests, including speed races, dead stick landings, balloon bursting and acrobatics. A Goodyear blimp and an Autogiro will participate. Passenger carrying in the blimp and open and closed planes will be carried out.

D. J. WILBER, formerly divisional sales manager, and John H. Mayforth, a district sales manager for the Robert Bosch Magneto Company, recently affiliated with the Scintilla Magneto Company, Inc., Sidney, N. Y., a subsidiary of the Bendix Aviation Corporation.

JAMES WORK, formerly vice president and general manager of the Detroit Aircraft Corporation, has affiliated with Seymour J. Baum, Inc., manufacturers of aircraft products, Elmhurst, L. I., according to a recent announcement of officials of the Seymour J. Baum company.

J. V. SHEEHAN, former traffic representative for the Philadelphia district of the Ludington Lines, has been named general traffic manager for the lines with headquarters in New York.

MAINE

[L. E. FLETCHER]

Pass Bills Favoring Aviation

THE Maine Legislature, which recently adjourned, passed two bills favoring aeronautics. The first, an airport enabling act, provides for acquisition, development and operation of airports by cities, towns and counties of the State.

The second act provides for the establishment of an aeronautical fund with uncollected tax refunds allowed on the sale of aviation engine fuels. The money acquired in this way is to be expended for promotion of aeronautics within the State.



(Acme-P. & A. Photo)
Louise Thaden and Phoebe Omlie on the field at the National Aircraft Show

THE KENNEBEC FLYERS' CLUB has been formed at Augusta. Burtis F. Fowler is president and treasurer of the club and George O'Donnell is vice president. An OX-5 Curtiss Robin monoplane has been ordered for instruction and other purposes.

MAINE AIR TRANSPORT COMPANY, Rockland, capitalized at $200,000, has been incorporated. President of the company is William H. Wincapaw and treasurer is Alan L. Bird. Service from Rockland is planned.

PENOBSCOT AIRWAYS, INC., East Millinocket, Me., plans to establish an air passenger transport service to include Bangor, Millinocket and cities in Aroostook County. The company operates a Travel Air biplane and plans to acquire an amphibion in May.

CAPT. William H. Wincapaw has resigned as manager of the Curtiss-Wright airport, Rockland, Me., and has been succeeded by Lieut. Frank M. Ambrose. The Curtiss-Wright Flying Service maintains a seaplane base at Rockland in addition to the airport.

RHODE ISLAND

[A. R. JOHNSON]

THREE Rhode Island boys will be sent to the national contests of the Airplane Model League of America. Tournaments to decide representatives of the Rhode Island Aviation League, Model Airplane Division, are being held in April and May in indoor and outdoor trials. Entrants will also qualify for the New England Championship in Boston.

A RESOLUTION appropriating $68,500 from the general treasury for the use of the State Airport Commission has been introduced in the legislature. Of the amount requested, $31,000 would be used for "fencing and otherwise improving and maintaining the airport." The remainder of the amount, $37,500, was designated for the purchase of land.

PENNSYLVANIA

[B. F. PRYOR]

Airline to Increase Service

GEORGE ECKMAN, acting manager of the Wyoming Valley Airport, Wilkes-Barre, Pa., has announced that the Frank Martz Airlines Company, a subsidiary of the Frank Martz Coach Company, will purchase three additional Bellanca planes for the purpose of doubling its present air service between New York and Buffalo. The firm is at present operating two Bellanca Pacemakers and a Fokker Universal, making two trips daily from Wyoming Airport to New York City and one round trip between New York City and Buffalo. William Mueller has been appointed chairman of the executive board of the airport committee.

The airport is enrolling a club of thirty members in a special course of twenty hours' instruction and ground school work. The cost of the course has been fixed at $350 per student.

THE Horizon Company, a subsidiary of the Haddock Coal Co., of Wilkes-Barre, has received the PCA-2 Autogiro purchased from Pitcairn Aircraft, Inc.

Developing Scranton Airport

THE Paramount-Publix Corporation has donated to the Scranton Airport, Scranton, Pa., a revolving beacon light of 750,000 candlepower. The light will be placed in position at the field some time before the scheduled opening in the early part of June.

Work at the field has been held up because of inclement weather. The work is being rushed to completion and the grading and drainage job is practically finished with the exception of the rolling of the surface. The job required the removal of over 400,000 cubic yards of earth. The General Contracting Company has handled this work under the supervision of the Austin Company of Cleveland, airport engineers

PHILADELPHIA

[R. GARD]

Autogiro Sales Plan Announced

DELIVERIES of the new Autogiro will commence in May. Pitcairn Aviation of Pennsylvania, a subsidiary of Pitcairn Aircraft, Inc., has been appointed the Philadelphia dealer.

This dealership has been established for the purpose of providing a laboratory for the sales department at the factory to work out sales policies for the dealer organization as a whole, and provides a model operation which the Autogiro dealers can study. All Autogiros will be sold entirely through a dealer organization, no deliveries being made from the factory. The purchaser of each ship will be given free flying instruction in his own Autogiro by the dealer if he so desires. The new Autogiro is a two-place, open-cockpit ship powered with a 125-horsepower engine.

IMPROVEMENTS at Somerton Airport are going steadily ahead. A group of trees which formerly stood at the southeastern end of the field has been removed. A section bordering the airport has been leased as a golf course. Eight new students recently signed up for instruction by Ernie Buhl, operator of the field.

A PLAN has been placed before the Post Office Department to provide for the landing of air mail planes on the roof of the new Federal Building. The Aviation Committee of the Chamber of Commerce submitted the plan.

MARYLAND

[E. W. WAESH]

THE BOARD OF ESTIMATE of Baltimore, Md., has voted to spend an additional $150,000 on the new Baltimore Municipal Airport. The $150,000 will be used to place a berm or protecting wall of sand and clay before the main bulkhead of the airport.

THE B/J AIRCRAFT CORPORATION, Baltimore, Md., has been awarded a contract for the delivery of fifteen pursuit planes to the Army Air Corps at a cost of $267,436. These planes will be of the two-place type. Provision of spare parts is included in the contract. Equipment includes direct-driven engines with normal horsepower rating of 600 at 2,400 revolutions per minute.

THE GLENN L. MARTIN COMPANY, Baltimore, Md., has been awarded a contract by the Navy Department for twelve diving bombers to be constructed at a cost of $525,000.

OHIO

[T. E. LUNSFORD]

Form New Flying Club

THE Ironton Aerial Club, Ironton, Ohio, was recently organized at a meeting held at the Hotel Marting. The club proposes to purchase a new plane and inaugurate a school of training, under direction of a licensed instructor. Members will have the opportunity of learning to fly at a specified rate. Present plans call for the use of the Sedgwick landing field, a mile below the city.

THE season at the Gallipolis airport will be officially opened May 29-31 with an air circus. Contracts have been made for a new Autogiro ship.

Airline Cuts Fares

CONTINENTAL AIRWAYS, operating between Columbus and Chicago, have reduced their rates between the two points to $18, according to Frank J. Macklin, district traffic agent. Rates to other points on the route are: Springfield, $3; Dayton, $4.50; Muncie, Ind., $8, and Kokomo, Ind., $11.

INCORPORATION papers have been issued by the Secretary of State to the Sundorph Aeronautical Corporation, Cleveland. The company is authorized to issue 250 shares of no par value stock. The incorporators are Donald W. Patrick, Harold C. Pedersen and Eiler C. Sundorph.

CONSTRUCTION of a new steel fireproof hangar on the Bucyrus Airport, Bucyrus, Ohio, is expected to be completed May 1, when the field will be taken over and operated by Miss Lauretta Schimmoler.

COLUMBUS

[W. DONALD WALTER]

National Guard Flight

A SQUADRON of seven Douglas 0-38's from the 37th Division Aviation, Ohio National Guard, flew from Cleveland to Columbus recently on a cross-country training mission. An 02-H accompanied the flight as photographic ship. At Columbus the ships flew a formation over the city, with Governor White as guest of honor in Major Herbert's ship. The planes left for Cleveland about three o'clock. The entire flight, in command of Major Herbert, was made

in close formation, including the take-offs and landings. The flying of these National Guard boys was a real treat, and would have done credit to any Regular Army organization. Major Herbert and Lieutenant Shorty Cummings, Regular Army instructor detailed to this squadron, have every reason to be proud of the splendid training evidenced by these pilots.

CAPTAIN PHIL L. WILLIAMS, Air Corps Reserve, returned a few days ago from Florida, and is putting in a lot of time in the Norton Field ships. Captain Williams is one of the old-timers at Norton Field, having been flying out of this station since it was established in 1923.

MICHIGAN

Stinson Announces Program

PRODUCTION program for 1931 of the Stinson Aircraft Corporation, Wayne, Mich., was recently announced by the company. In addition to the four-passenger Stinson cabin Junior, powered with a nine-cylinder Lycoming engine of 215 horsepower, three other Stinson models are available. They are: the four-passenger Stinson Junior powered with a 300-horsepower Wasp engine; ten-passenger trimotor Stinson Airliner, powered with three Lycoming engines of 215 horsepower each; and a trimotor executive model. The company's policy is to concentrate on a smaller number of models.

[J. M. HILL]

Airports Temporarily Licensed

THREE temporary airport licenses have been issued by the State Board of Aeronautics following an inspection trip by S. B. Steers, inspector of the board.

All three of the airports are now under construction and will be finished within thirty or forty days. The new fields are as follows: Skyport, at Mt. Morris, to be operated by Northern Aircraft Corporation, a flying school and service, now located at Bay City—field is 2,650 by 1,650 feet, and will have three steel hangars; Genesee County Airport, Grand Blanc, to be operated by Edward S. Schmier—field contains eighty-seven acres and will have a steel hangar, 75 feet by 80 feet, now being built; Gaylord Airport at Gaylord, eighty-acre field, 3,200 feet by 2,640 feet.

INSTRUCTION of officers and troopers of the Michigan State Police in the enforcement of state and Federal air laws has been undertaken by the Michigan board of aeronautics. The instruction course covers the detection of violations of air laws and the manner of handling such cases. Officers of the police organization have received the training, and non-commissioned officers and troopers will take the course soon. Maj. Floyd Evans, director, and S. B. "Buck" Steers, inspector of the board, are in charge of the course.

WISCONSIN

[W. SCOLLARD]

Would Create Board and Commissioner of Aeronautics

A BILL recently introduced into the state legislature provides for the appointment by Gov. Phil La Follette of a state board and a commissioner of aeronautics. Appropriation of $15,000 to the board for its duties and $4,800 as salary of the commissioner is asked. The commissioner, who would be a Federally licensed airplane pilot of at least six years' experience, would be appointed for a six year term.

Hangars for Private-Owner Planes

MAJ. STANLEY E. PIASECKI, manager of the Milwaukee County Airport, has announced plans for the erection of twelve metal hangars at the port for rental to individual private plane owners. With the completion of the new hangar for the Northwest Airways, early in April, the port became the base for Chicago-Milwaukee-Twin Cities route and also the Fox River Valley line of the Northwest concern.

MIDWEST AIRWAYS, INC., Milwaukee, has sold a Warner-powered Fleet de luxe plane, equipped with Airwheels and pontoons and special flying equipment, to Capt. William F. Ehrengart, vice president and general manager of the Land of Lakes Airways, Inc., at Delafield, Wis. This is the first of a fleet of training ships to be used by Capt. Ehrengart for the purpose of giving flying lessons to students of the St. John Military Academy and to civilians. The Airway concern is erecting a steel hangar on Lake Nagawicka, located near the academy, at a cost of $8,000.

St. John's Military Academy offers land and seaplane flying instructions in connection with its academic courses.

MINNESOTA

MINNEAPOLIS

[H. FREDEEN]

ESTABLISHMENT of a public service and repair hangar at the Minneapolis terminal of the Northwest Airways, Inc., was recently announced by the officials of that company. Oscar Knutson is in charge.

THE Great Northern Flying School recently resumed flying activities at the Minneapolis Airport with Mark Hord as chief flight instructor and Paul D. Paine in charge of the ground school.

WALLACE SEEBACK is giving flight instruction and operating a sight-seeing and air taxi service with the Monocoupe 90 which he recently purchased.

TO PROMOTE interest in her flying class for women, Florence Klingensmith has been giving a series of radio lectures on aviation, during which she explains the fundamentals of flight and relates many interesting experiences. Her class comprises five flight students and seven ground school students. Instruction is given in her Monocoupe.

PLANES operating from the Minneapolis Airport during March carried 2,011 passengers and flew 155,219 miles, LeRoy A. Johnson, assistant airport manager, recently announced. Transport planes made 244 arrivals and 241 departures, carrying 588 passengers.

NEBRASKA

[R. O. BENNETT]

THE WESTERN AIR SERVICE CORPORATION, which for more than a year has been operating trimotor Stinson ten-passenger planes between Omaha and Oklahoma City, has extended its service to include Tulsa, Okla., on the south and to include Sioux City, Ia., on the north.

BY A UNANIMOUS vote of the Lincoln City Council, the municipal airport has been named Lindbergh Field in honor of Col. Charles A. Lindbergh, who took his primary flying training at Lincoln.

THE LINCOLN AIRPLANE AND FLYING SCHOOL has opened a Spanish division of the school. This department is headed by Señor Lee Bonzo, a native of Spain, who was educated in several American Universities.

JACK KOLBENSCHLAG, former Army pilot, has formed a company at Lincoln to be known as the Nebraska Flying Service, Inc. The company will operate at the Union Airport, where a hangar site has been leased.

APPROVED school license for 1931 has been granted the Lincoln Airplane and Flying School. Mechanical students at the Lincoln school have put the finishing touches on a two-place high-wing cabin monoplane, which was designed and constructed entirely by them under the supervision of the school instructors.

THE SOUTHERN NEBRASKA AVIATION CORPORATION, which was recently organized by F. D. Henderson, will operate a chain of aviation schools in eight southern Nebraska towns: Superior, Hebron, Fairbury, Geneva, Clay Center, Blue Hill, Holdredge and Orleans.

ALVA N. WHITE has organized the White Flying Service for commercial operation of aircraft at Lincoln.

OMAHA

[C. P. RODMAN]

To Improve Omaha Airport

COMMISSIONER DEAN NOYES, in charge of the Omaha Airport, has announced that work will soon start on the executive buildings at the field. He plans a two-story building with a 75-foot signal tower, to cost about $50,000. The first floor will be used as a joint ticket office for all lines entering Omaha, offices for the various lines, dining room and kitchen. A terrace for the accommodation of visitors would extend entirely around the second floor.

OFFICIALS of the Midwest Aviation Company of Omaha recently elected are as follows: D. C. Eldredge, president; Amos Thomas, secretary; S. E. Hughes, treasurer; and A. R. Burnham, C. E. Birnham, L. D. Miller and Stover Deats, re-elected vice presidents.

ILLINOIS

CHICAGO

[M. E. HUITT]

PLANS are under way for an outdoor light-plane show sponsored by Aeronautical Chamber of Commerce and staged at Riverview Amusement Park in Chicago July 6-19.

THE Bowels "Fly-Urself" Service, located at the Municipal Airport, has been in operation for one year. During this time Mr. J. C. Bowers reports a very profitable year, with ships in the air around 3,200 hours. This time was run up by 182 student, private and L. C. pilots. Mr. Bowers has used Avian, Waco F., States, and Great Lakes ships, the Waco being in the air 129 pay hours over an eighteen-day period.

INCLUDED in the annual maneuvers of the Army Air Corps this month will be an "attack" on Chicago. Remaining in Chicago over night the attack and observation planes will land at the Municipal Airport, pursuit planes at Curtiss-Wright north of the city and the bombers at Lansing, Ill. Major Ralph Royce, Cook County's original air officer, will be in command of the National Guard planes to participate in these maneuvers.

MISSOURI

ST. LOUIS

[T. P. WAGNER]

Lambert-St. Louis Field Granted A1-A Rating by Government

AN A1-A rating has been issued by the United States Department of Commerce for Lambert-St. Louis Field, St. Louis' $2,000,000 municipal airport.

Lambert-St. Louis Field was established ten years ago by Maj. Albert Bond Lambert. The city took over the field in 1928 when the $2,000,000 bond issue was passed by a large majority. Since that time the operation of the field has been directed by a Municipal Airport Commission composed of leading citizens, headed by Director of Public Welfare Harry Salisbury.

The airport, located 16 miles from downtown St. Louis at the junction of Natural Bridge and Bridgeton Station roads, has a landing area of 375 acres. There are four hard surfaced runways having a total length of 12,600 feet. The runways are connected and are augmented by a concrete apron 2,290 feet long and 200 feet wide where passengers board and leave planes. A $10,000 lighting system, including a 4,000,000-candlepower floodlight for night landings, was formally turned on at a public ceremony recently. The Airport Commission is at present considering plans for a three-story Spanish type administration building, the last major improvement contemplated.

Four airlines use the field.

IOWA

[R. W. MOORHEAD]

THE AMES FLYING CLUB, Ames, Iowa, was recently organized. C. R. Laubenfels, instructor in the Iowa State college mechanical engineering department, is flying instructor of the club. D. A. Mills, Iowa City, graduate student in aeronautics at the college, is president of the new organization. Six of the nine members are students.

Each member has paid $50 membership dues. The club believes that the dues, together with renting the plane to members at $4.50 per hour for solo flying and $7.50 per hour for instruction, will pay for the ship to be purchased by the club.

Form New Air Company

F. C. ANDERSON and Elbert Clayton have organized the Des Moines Airways and purchased the Mid-West Corporation's equipment and holdings.

The new company will engage in training pilots, operate air taxi service between Des Moines and other cities and make general passenger flights. Des Moines Airways will operate from the municipal airport.

OKLAHOMA

[W. H. WITT]

FIRST state high school course in aeronautical engineering has been put in at Capitol Hill High School at Oklahoma City.

THE McDougal measure passed recently by the legislature regulates use of balloons, airplanes, and seaplanes by the state. It prohibits hunting from aircraft of any description and places enforcement of the law under the jurisdiction of the state highway department.

AN 18-hole golf course has been equipped for pilots and adjoins the new municipal airport in Oklahoma City.

ALABAMA

[O. G. JONES]

ALABAMA'S newest airport will be opened formally May 30-June 1, the date tentatively set by city officials of Birmingham. The field, costing $1,000,000, is rapidly nearing completion.

Runways are now under construction and as soon as these are completed planes will be allowed to set down on the field. The grass sod is not yet in condition to receive ships.

Stedham Acker was recently appointed manager of the field by Jimmie Jones, president of the city commission.

FLORIDA

[W. F. CORNELL]

TAMPA AIRWAYS has extended free ground lessons to forty-eight Tampans, who are taking lessons twice a week at the municipal airport. The course, prepared by C. E. Peavey, manager of the flying school, consists of intensive training in lecture work, home study review and inspection of flying equipment.

R. L. PIERCE, representative of the Pensacola Metal Aircraft Company, has announced the formation of a company for construction of three-winged seaplanes for service between Pensacola, Tampa and Havana, Cuba.

A model was shown at a meeting of the Tampa Chamber of Commerce, and Pierce said that the company had spent $270,000 in experimental work.

THE Federal Government has leased Douglas Field, Stuart, Fla. A. H. Hadfield, junior engineer of the Airways Division of the Department of Commerce, is in charge. The Government plans to improve the field to the extent of $20,000 and has already a crew working. A revolving beacon and 36 boundary lights will be installed.

CONTACTS

[By FRANK E. SAMUELS]

WHILE at the Los Angeles Airport, Mines Field, we had the opportunity of observing the Department of Commerce test flights of the "Baby Pursuit" plane developed by Clarence O. Prest. Piloted by Eddie Martin of the Martin Flying School, Santa Ana, it was put through the test maneuvers. Its short take-off and slow landing speed, together with a high speed to satisfy the most fastidious, make it an ideal little sport plane.

BOB BLAIR, who was the original Buhl distributor for the West Coast, is now at the Los Angeles Airport, as vice president and manager of the Los Angeles Aircraft, Ltd., specializing in buying and selling of airplanes, cross-country and short sightseeing flights and student instruction. Bob is one of our old time pilots.

THE AERO BROKERAGE SERVICE COMPANY, located at the Los Angeles Airport, reports sales for the past month as follows: Aeromarine Klemm to Kenneth and M. J. Brooks, of Alhambra; OX-5 Travel Air to Norman K. Hawkins of Los Angeles; J-5 Stearman to Dr. Franklin E. Cutler of San Diego; J-5 Eaglerock less motor to John Penfield of Modesto; J-6-7 Travel Air to Morey C. Cope of Santa Cruz; and J-5 Stearman to Charles F. McGrew II of Santa Monica. These planes are all for private use. A Great Lakes with American Cirrus motor was sold to E. P. Mullaney of Long Beach and a Kinner Fleet to L. A. Aircraft, Ltd., both for commercial use; and an Axelson-powered Travel Air to W. A. Hunt of Riverdale, Calif., to be used by a flying club. Over $5,000 worth of airplane motors, parachutes and propellers were also sold during the month.

ANOTHER OF OUR old time reliable pilots, who has entered into a new venture is Earl W. "Chub" Gordon, who with his associates, has taken over the Western Division of the Skywriting Corporation of America. The corporation is at present located at the Los Angeles Metropolitan Airport. Travel Air planes, with the latest skywriting equipment are being used and

Chub reports business as being much better than he anticipated.

SINCE THE organization of Hancock Foundation College of Aeronautics at Santa Maria, the school has recruited its enrolled cadets from nearly every state in the Union, as well as from many foreign countries. A recent entry, the second from Alaska, is George J. Feltes, S. J., a member of the famous Flying Jesuit Brotherhood, of the Northland. Brother Feltes intends to pile up his hours at the college to be able to qualify for a transport pilot's license before returning to his post in the Far North. Brother Feltes is one of the 37 Jesuit priests engaged in missionary work in the Alaskan Territory.

TRANSCONTINENTAL AND WESTERN AIR, which will maintain a 24-hour schedule on their run between Los Angeles and New York City, has purchased five new Northrop all-metal monoplanes, with a top speed of 170 miles per hour and a cruising speed of approximately 140 miles per hour.

ARIZONA

[H. G. WILSON]

New Air Corps Hangar

PLANS are being made for a modern $53,000 hangar to be constructed on the Tucson Municipal Airport. The Army Air Corps has been given extensive leases on the building. The present hangar is being moved from the western side of the field to the south line to a site adjoining that set aside for the new building, which will be constructed this summer. Funds for the building were appropriated in a special bill passed at the last session of Congress. A site two miles east of the airport has been selected for the proposed $40,000 radio station to be built as part of the lighthouse chain of Department of Commerce stations.

Use of Auto Provided Free to Transient Pilots at Tucson Airport

THE TUCSON CHAPTER of the National Aeronautic Association has purchased an automobile through the aid of Pete Waggoner, chapter president, for the use of visiting fliers. It is left at the Tucson airport, full of gas for the free use of any visiting fliers. C. B. Cosgrove, airport manager, carries the keys to the car.

CALIFORNIA

H. A. BURGESS, general traffic manager of Western Air Express and Midcontinent Air Express, with headquarters in Los Angeles, has resigned to become sales manager for Radio Laboratories, Los Angeles. The Radio company was recently formed to manufacture radio shortwave equipment for marine, aircraft and home use.

To Award Boeing Scholarships

W. B. Stout has accepted the Chairmanship of the National Committee of Award which will choose winners from competing college and university students for the W. E. Boeing scholarships offered at the Boeing School of Aeronautics. These scholarships have a cash value of $7,200. Selections will be made by the committee at Detroit, Mich., May 8. In 1930 the first prize, a Boeing master pilot course of 204 hours of flying and 924 hours of ground school, was won by Ralph J. Moore of Stanford University.

ALAMEDA

[H. V. WALDORF]

Start Parcel Delivery Service

AIR FERRIES, LTD., has inaugurated a door-to-door delivery service between cities of the San Francisco Bay region. Packages are picked up by motorcycles and speeded to the terminals of the company's transbay service. Amphibion planes transport the packages to the other side of the bay in six minutes where a second motorcycle furnishes the last lap of the service. The average time for delivery is 40 minutes. The rates are about on a par of services using the slower ferryboats for the bay link.

OPERATIONS at the San Francisco Bay Airdrome in March included 3,388 landings, and 6,004 passengers, of which 2,013 were carried by transport planes.

A HANGAR DANCE and night air show was staged by the Oakland chapter of the National Aeronautic Association to mark the completion of the new hangar at the San Francisco Bay Airdrome. The hangar measures 600 feet by 120 feet.

OAKLAND

[H. V. WALDORF]

Complete Seaplane Base

FIRST official tests of the seaplane base at Oakland Municipal Airport were made recently by a squadron of planes from the navy cruiser *Louisville*. The base is fitted with a large landing ramp at the head of a mile-long channel. The channel ranges from 160 to 300 feet in width.

A TOTAL of 7,024 plane landings was made at Oakland Municipal Airport during March, according to a report issued by the Board of Port Commissioners. Passengers carried totaled 2,773. There were 353 students enrolled in the flying schools conducted at the airport.

W. I. G. A. Sponsors Glider Meet

More than a dozen gliders participated in a meet held recently at San Francisco under the auspices of the Western Interclub Glider Association. Al Scamahorn of the San Francisco Glider Club won the duration event with a flight of 75 seconds. Robert Nichols of San Francisco won the spot landing contest. C. J. McConauhy of the Bay Cities Club took first place in the distance event with a flight of approximately one-half mile.

Test New Parachute

IN a demonstration of a new type parachute, Bert White, factory representative of the Switlik company, tossed the safety device from a plane at less than 90 feet over Oakland Municipal Airport. The parachute opened immediately and lowered a 118-pound rope dummy to earth at a slow rate of speed.

WASHINGTON

BECAUSE of the number of requests coming from model-builders in all parts of the country for three-view drawings and photographs, the Boeing Airplane Company has established a model bureau, which supplies drawings and photographs at cost.

BOEING AIRPLANE COMPANY is employing approximately 950 men and expects to maintain its force at practically this figure for the greater part of the year, according to a recent announcement of company officials.

[C. M. LITTLEJOHN]

MRS. DWIGHT HARTMAN has been elected president of the Women's Aeronautic Association of Seattle. She plans to launch a summer of intense flying and social activity among the forty members of this club. Miss Donna Balch is the new president of the Junior Women's Aeronautic Association of Seattle.

EARLY in April air passenger service between Port Angeles, Wash., and Seattle, Wash., was inaugurated with two daily round trips, by the Port Angeles Air Transport, Inc. Stinson-Detroiter monoplanes are used. Maurice King is pilot.

To Improve Airport

EXPENDITURE of $20,000 to improve the municipal airport at Seattle is asked by the Seattle chapter of the National Aeronautical Association in a recent letter to the Board of County Commissioners in Seattle. Ten thousand dollars would be spent for improved lighting facilities and other improvements.

MAMER AIR TRANSPORT, INC., has inaugurated daily air service between Seattle, Tacoma and Spokane, Wash.

UTAH

[G. PERRINS]

MODERN lighting facilities are being installed at the Salt Lake Airport, Salt Lake City, according to Verne G. Halliday, manager of the field. A new revolving 4,000,000-candlepower beacon, new hangar floodlights and two new field runway lights are in addition to the 4,000,000-candlepower floodlights already in use and the 5,000,000-candlepower floodlight for use in fogs.

SALT LAKE'S importance as an air mail center moved up a notch on April 1 when the new Government schedules calling for augmented service between Chicago and San Francisco via Salt Lake went into effect. Now Salt Lake receives and dispatches mail three times daily instead of twice a day as before.

NORTHWEST

[F. K. HASKELL]

ARMY, navy and civilian planes will take part in an air circus to be given at the airport, Everett, Wash., on May 8 in conjunction with the visit of Lieut. Walter Hinton. Plans will be supervised by O. S. Ryckman, manager of the port.

NEW AERONAUTICAL BOOKS

Reviewed by STEPHEN A. McCLELLAN, B.Sc.

THE AIRCRAFT YEAR BOOK FOR 1931

Edited by

THE AERONAUTICAL CHAMBER OF COMMERCE

IF THE aeronautical enthusiast were limited to acquiring one book a year, that book should be the Aircraft Year Book. The 1931 edition contains all the well-known chapters on American air transport, plane manufacture, engine manufacture, design trends, private flying, airports, airways, aircraft legislation, Federal promotion and regulation, etc. The story of our Service aviation has been properly split into two separate chapters devoted to the army and navy respectively. Aircraft radio is the only fundamental chapter dropped and this does not mean that the subject is ignored. An excellent innovation is the chapter "Latin America by Air."

The customary three-view drawings of current aircraft and engines are to be found in their old place at the back of the book, together with the chronology of important aviation happenings in 1930, the exceedingly useful appendix, trade index and index. The book is also up to standard in the quantity and pertinency of its pictures, diagrams and maps.

MODERN DIESEL ENGINE PRACTICE

By ORVILLE ADAMS

MODERN DIESEL ENGINE PRACTICE is a thoroughly practical text appealing to the powerplant engineer, the Diesel operator and the technically-inclined business executive, rather than the student of theory.

A brief history of the evolution of Diesel engines precedes a sound general consideration and specific technical application of stationary, portable and mobile units. The practical operation and maintenance of all the fundamental types is clearly and completely treated.

The chapters on engineering, the Diesel plant, efficient lubrication, and Diesel repair and maintenance are particularly commended to interested executives.

In addition to a fine exposition of the application of Diesel power to railroad locomotives and automotive products, there is a very full account of the Packard Diesel aircraft engine.

JANE'S ALL THE WORLD'S AIRCRAFT, 1930

Edited by C. G. GREY

IT IS always a combined treat and education to peruse this annual publication. The 1930 Jane's All the World's Aircraft is the same authoritative and remarkably complete work to which we are accustomed, but it has been cleverly rearranged to make its voluminous contents readily yield specific bits of information without even consulting an index, although one is provided.

The new system is a logical adaptation of the alphabetical arrangement, by countries, in the historical sections of previous issues. This alphabetical arrangement by countries is now applied to each section and the pages are so numbered that one can open the book anywhere and determine instantly what section he is looking at. The sections are: (A) "The World's Aeronautical Progress," consisting of historical notes on the year's work of each nation in military, naval and civil aviation together with the names and addresses, where obtainable, of the aeronautical officials, departments, associations and publications of the various nations. (B) "Historical." This is the outline of the service aviation facilities of the different countries. (C) "All the World's Aeroplanes" consisting of complete specifications of all current civil and military airplane types produced throughout the world during 1930. (D) "The World's Aero-Engines," same as section C applied to aircraft powerplants. (E) "The World's Airships," same again applied to airships.

BIRD LIFE AT THE POLE

By COMMANDER CHRISTOPHER ROBIN

As told to Wolcott Gibbs

A GRAND TRAVESTY on recent elaborate polar expeditions. It is easily comparable to such side splitters as "The Cruise of the Kawa" and "Salt Water Taffy." Nothing could be better for the tired transport pilot and others seeking relaxation.

ZEPPELIN

By MARGARET GOLDSMITH

COUNT FERDINAND ZEPPELIN was a character whose life aside from his very real contributions to aeronautics justifies a biography. Miss Goldsmith's book is the only biography of this pioneer now in print in English. What there is of it is good reading and interesting, despite a few silly errors such as the reference to the glider pioneer, Lillienthal, being killed in "machineless flight."

The real shortcoming of the book is its failure to record just how much Count Zeppelin contributed beyond the original conception to the development of the airships bearing his name. Zeppelin's equally fundamental pioneering in the development of all-metal heavier-than-air machines is completely ignored.

TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

Ateco Hydraulic Dirtmovers

DESCRIPTIONS and illustrations of the Ateco hydraulic dirtmover for use with Caterpillar Tractors are contained in a booklet recently issued by the American Tractor Equipment Company, Oakland, Calif.

Little Giant Extractors

THE NEW line of Little Giant screw extractors produced by the Greenfield Tap and Die Corporation, Greenfield, Mass., are described and illustrated in a circular recently issued by the company.

Elgin Aircraft Instruments

A LOOSE-LEAF booklet bound with a carboard cover, illustrating and describing the aircraft instruments made by the Elgin National Watch Company, Elgin, Ill., has been prepared by the company.

Light Tiger Engines

A FOLDER describing the line of Tiger aircraft engines made by the Light Manufacturing and Foundry Company, Pottstown, Pa., has been issued by the company.

Ex-Cell-O Organization

"EX-CELL-O, Its Plant, Personnel and Products," has been prepared by the Ex-Cell-O Aircraft & Tool Corporation, Detroit, Mich. The text is illustrated with numerous photographs.

Airport and Airway Lighting

A BOOKLET, "Flying Beyond the Twilight Zone," covering airway and airport lighting, has been announced by the Westinghouse Electric and Manufacturing Company.

Air Conditioning

A BOOKLET entitled, "Air Conditioning," which discusses the production and maintenance of certain required temperature and humidity in the atmosphere indoors, and the service which the company provides for air conditioning in industry, has been prepared by the Carbondale Machine Company, Carbondale, Pa.

Berry Aircraft Finishing

FIFTH edition of "Specifications for Aircraft Finishing" has been prepared by Berry Brothers, Detroit, Mich. The booklet is intended to give a comprehensive presentation of the subject and to make the technical information contained therein available to all persons interested in methods of aircraft finishing.

Acco Industries Booklet

A POCKET size booklet which lists the products of the American Chain Company, Inc., Bridgeport, Conn., and associate companies was recently issued. The group of companies is known as Acco Industries.

Seaplane Ramp Blueprint

BLUE PRINT of a seaplane ramp, offered only as a suggested method of construction, has been prepared by the Standard Oil Company of Indiana, Detroit, Mich., for the purpose of assisting cities interested in the construction of such a ramp. The blue print, to be stressed by an engineer if used, may be obtained free of charge by anyone desiring, according to P. A. Raupagh, manager.

DIGEST OF A. S. M. E. TECHNICAL PAPERS

(*Continued from page 80*)

radiators of the corrugated type, the new Curtiss-type separate-tube radiator as installed on the Page Racer, and the Supermarine smooth-skin type radiators are described.

The author concludes that the use of wing radiators for general service is questionable. They are expensive to build, and, due to the thin material of which they are made and their exposed location, they are subject to damage. The use of Prestone reduces the efficiency to about one-third of the water-cooled type and the gain in speed from a wing radiator over the core-type installation is cut to a very small amount. In this case its use would probably be confined to planes of very high speed.

METAL CONSTRUCTION

Construction of the Metal Airplane, G. H. Prudden.

QUESTIONS of why all-metal planes have cost so much more than other types, and how they may actually be built for less and at the same time with an increase in the quality of the product, are discussed. The author describes the soft-metal die process and drop hammer which he employed for forming duralumin parts for airplanes. In the lead-and-zinc die process which he adopted there are three methods of approaching the die, namely, by means of clay and plaster, by plaster alone, and with a wood pattern. The production of these dies does not cost more than 10 per cent of the price of dies machined out of steel. The method is said to be an accurate one and to give a great saving in set-up. The advantages of the drop hammer over other types of presses are also brought out.

DIGEST OF FOREIGN TECHNICAL PAPERS

(*Continued from page 72*)

AIRPLANE COMPARISON

Comparison of Airplanes—Diagram of Ceiling (Comparison des avions—Abaque des plafonds), J. Kerguistel. "L'Aeronautique," Vol. 13, No. 142, March, 1931, pp. 89-92, 1 fig.

THE purpose of the paper is to present a practical and simple means for comparing airplanes and for interpolation in the case of climbing, and to permit an approximate prediction of the performance of the airplane to be made rapidly. A diagram of airplane ceiling in function of the load modulus is illustrated. By this means it is possible to determine immediately the approximate ceiling and to find very easily the new ceiling of the same plane with a different load or another engine. The curves in the diagram show: tests at different loads of the same airplane with the same engines for a French two-engined seaplane, the Rohrbach Romar and the Rostra tests of the same plane with different motors and weights for observation and commercial planes and the Dornier Wal seaplane; airplanes geometrically similar; the influence of military equipment; the low efficiency of amphibions; and the influence of aspect ratio.

AERIAL SURVEYING

The Fourcade Stereogoniometer, M. Hotine. (British) Air Survey Committee—Professional Paper No. 7, 1931, 159 pp., 48 figs.

THE instrument described consists of two distinct parts, a three-dimensional measuring stereoscope and an automatic plotting mechanism. The former may be used alone for the purpose of establishing scale and level on a bare minimum of ground control, and may thus be compared with the use of a theodolite in executing secondary triangulation on the ground. The automatic plotting mechanism may be applied to simplify the use of the instrument for control purposes, and also for large-scale detail plotting, or for more deliberate plotting on topographic scales.

A general description of the method and explanation of the terms employed throughout the paper is followed by a full description of the construction and adjustment of the first model together with some notes on the design of the second model. The relative setting "in correspondence" of a pair of photographs, and various alternative methods of determining from ground control the scale and level of the space image provided by such an individual pair are taken up.

The remaining chapters are devoted to an explanation of the processes involved in mapping from whole strips of photographs with varying amounts of ground control, commencing with a full three-point control on the end overlaps of the strip and ending with reconnaissance mapping controlled entirely by measurements of altitude during flight. One of the most valuable features of the method is its adaptability to varying conditions due to the fact that it requires no hard and fast type of ground control such as would be difficult or expensive to fix. Each step is illustrated by an example from practice. A determination of level elements, extension of base directions, effect of change in level of the first overlap of a strip, accumulation of error in strip extensions, and a summary of definition are given in the appendices.

NEW TIP-OVER MARKER LIGHT CONE DEVELOPED BY WESTINGHOUSE

A RECENT development of the Westinghouse Electric and Manufacturing Company in airport lighting equipment is the Tip-Over Market Light Cone with flush type disconnecting pothead, a landing field marker light, highly visible in daylight as well as at night, which does not damage a plane that accidentally strikes it and which, at the same time, automatically provides protection for the circuit supplying it.

The cone is placed over the disconnecting pothead which is mounted flush with the field surface. When the cone is struck by a moving object, it is either triped out of the way, or, in case of snagging, carried along. If a glancing blow is the extent of the impact, the vanes bend out of the way, permitting free passage of the moving object. If the cone is struck directly by the landing gear or lower wing of the plane, its construction is sufficiently light to permit its being crumpled up without serious injury to the portion of the plane striking it.

When the cone is struck or removed from the pothead, the cap is pulled out simultaneously with the movement of the cone, and the high voltage is broken. Then the circuit to the remaining marker lights immediately is reclosed, preventing an interruption of service, and a trap door snaps into place, covering the high voltage circuit and permitting safe passage of a plane over the pothead.

The body of the cone is constructed of 26-gauge lead-coated steel, and four vanes of the same material are attached to the upper part of the body. This vane construction assures high visibility. Different color combinations are used on the body of the cone when it is used as an approach light, a boundary light, or an obstacle light. A door in the lower section facilitates operating the disconnect and inspecting the unit. The pipe unit for attaching the marker light is welded to a small cup which fits over the top of the cone. A similar cup fits up under the top of the cone and slips over the lower extension of the pipe nipple. These two cups are locked into place by conduit locknuts on the lower extension of the pipe nipple, making the cone weatherproof and stable at the upper end. Nipple sizes of ¾ and 1¼ inches are standard, but any size up to, and including, 1¼ inches can be supplied. The lower edge of the cone has a bead rolled on the outside, adding to the stability of the unit. The diameter of the bottom of the cone is such that a snug fit to the flush type disconnecting pothead is assured.

The disconnecting pothead consists essentially of a cast iron body, hot galvanized inside and out, with a cast steel trap door attached. A standard porcelain pothead is mounted in the unit and held in place with four clips. A fuller board washer is supported on cast lugs directly below the pothead body, permitting the unit to be sealed with compound directly after wiring. A 2½-inch pipe plug is provided in the bottom of the unit to allow a drain pipe to be installed if desired. A pothead cap with terminals and a rubber shield for the cap are furnished with the unit.

The Tip-Over Marker Light Cone can be used for series or multiple circuits. It can be used either with or without the disconnect.

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FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST'S correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

GERMANY

By Edwin P. A. Heinze

THE GERMAN AVIATION UNION recently reported on its development during the first ten months of 1930, the results for the whole year not having yet been compiled. The membership has passed the 50,000 mark and fifty-four new clubs have joined the union. The number of certified sail-fliers has increased from 4,300 to 7,000 and of planes and gliders, from 643 to 1,100. Four times the number of sail-flying grounds, twenty-two, are now at the disposal of members all over the country, and 163 junior groups are now affiliated with the union.

The motored flight division is progressing very favorably. The union and its clubs own more than 100 powered planes. As the German law prescribes, every pilot must put in at least twenty hours of flying each year or his certificate expires. The union is making a new experiment this year to enable pilots of clubs not owning a powered plane to do their obligatory flying. Three planes are lent to itinerant tutors, who fly from one place to another in accordance with a set schedule and give these pilots an opportunity for flying under their supervision. Each of these three instructors will make sight-seeing flights with passengers at centers where the population otherwise has no chance of gaining practical flying experience.

The German Aviation Union is coping successfully with the reduction of flying costs. Arrangements are being made to reduce the all-risk insurance premiums to 11.23 per cent, including schooling risks. Formerly a premium of nineteen per cent had to be paid for normal and thirty per cent for schooling risks, inclusive. This considerable reduction has become possible because the union board of management has decided to take over part of the risks itself. The members will effect a considerable saving in landing, starting and general airport expenses, for the union has come to an agreement with the Luft Hansa for handling the planes of members at an extra low rate. The fees will be calculated at the normal wages plus fifty per cent for overhead expenses. This, of course, applies only to ports with Luft Hansa staff. A similar agreement has been effected with a number of repair workshops, which will make repairs at wage rates plus 100 per cent only.

A large increase in the number of powered planes is foreseen this year in Germany as the Aviation Union has designed a small two-seater standard plane to be built by the clubs in their own workshops. The more important fittings, production of which in a small workshop would be difficult, will be supplied by the union as also will the raw materials. The union is making arrangements with factories and dealers to effect a reduction of costs by large purchases. This arrangement is similar to the one already worked successfully for years past by the Rhoen-Rossitten glider and sail-plane association.

The balloon sport, reports the German Aviation Union, has developed excellently during recent years. In 1921 there were only three active balloon pilots, but this year there are 266. The union had seven balloons in 1923; now it owns sixty, which during 1930 made 550 ascents. These are only a few of the facts, which show the German movement to be immensely enthusiastic and active.

WOLF HIRTH, the famous German air-sailer, having returned from America to Germany, has accepted the management of the flying school opened recently at Grunau in the Riesen mountains in Silesia (Prussian province).

TO ENABLE youthful unemployed of the metal and wood working industries to keep in practice and gain further knowledge, the German Aviation Union has proposed to the German Labor Minister the inauguration of working classes for the production of sport plane parts. This suggestion is meeting with the support of most authorities and such working classes or tuition courses are now being organized.

SAIL-FLYING sport is being actively propagated in the German army. A battalion stationed at Rostock, on the Baltic coast, is being taught by the well known sail-flier, Lieutenant-Colonel Bade. Other army groups have taken up this sport in other parts of the country. An air-sailing group has been formed within the military sports union of the 1st battalion of the 18th infantry regiment at Paderborn. The group has joined the German Aviation Union and is building sail-planes on plans obtained from the latter.

THE FLIGHT program of the German *Graf Zeppelin* for this season has just been published. The airship will make two trips north to Iceland and the North Cape, another to the Mediterranean and a fourth probably to the Balkan States. In the second half of the year at least two long-distance voyages are to be made to South America. In between a number of social trips will be arranged to Egypt and Palestine, Sevilla and other places. These are mere sight-seeing trips, some of which are being undertaken by mutual arrangement with automobile clubs, the members of which desire to make an air trip through Germany.

THE MUCH coveted Golden Medal of the German Aviation Union, which has hitherto only been awarded in recognition of very special services fostering aviation in ten instances, has now for the first time been granted to women, to three, as a matter of fact, namely Miss Liesel Bach of Cologne, the German woman champion in acrobatic flying; Miss Marga von Etzdorf, who last year executed a number of long-distance flights to Constantinople, North and West Africa, and to Miss Elly Beinhorn, who recently made a very hazardous African flight.

THE LUFT HANSA recently held a press meeting at which six department managers made ten-minute lectures on their work giving the numerous journalists of the lay press a good idea of the responsibilities and activities in all the various sections of a large air transport company.

ENGLAND

A NEW record of six and one-half days for the London-Cape Town flight was established April 6 by Lieut-Comdr. Glenn Kidston in his American-built Lockheed Vega monoplane. His total flying time over the 8,000-mile distance was fifty-six hours.

Imperial Starts Experimental England-Australia Air Mail Service

FIRST Imperial Airways air mail from England to Australia left London April 4 in a nine-ton Armstrong-Siddeley air-liner, and was to arrive at Port Darwin on April 19, completing in fifteen days a 11,194-mile journey which would occupy twenty-eight days by surface transport.

The plane carried, in addition to the first Australian air mail, the Indian and African mails, the combined load representing a total of approximately 50,000 letters. The first Australian mail comprised roughly 15,000 letters.

The route followed by the service to Australia is via Paris, Athens, Cairo, Baghdad, Karachi, Delhi, Calcutta, Rangoon, Singapore, and the Dutch East Indies to Port Darwin, Australia.

Flying Time of British Light Airplane Clubs Reported

MEMBERSHIP in British light airplane clubs totaled approximately 7,000 at the beginning of this year, according to a recent official report. More than 100 planes are reported as being used for activities by these organizations.

The highest aggregate of flying hours was recorded by National Flying Services, comprised of several clubs, whose planes in 1930 flew a total of 13,143 hours. The Lancashire Aeroplane Club reported 278 members, 65 of whom are qualified pilots. The club operates five light biplanes, including one Moth and four Avians. Flying hours last year totaled 1,538.

The Midland club, with 443 members, completed more than 1,100 hours of flying

on four ships. The Scottish Flying Club completed 1,415 hours on four airplanes. This club reported 456 flying and non-flying members.

Three planes operated by the Cinque Ports Club averaged 417 hours each during the year, a total of individual flying time representing a distance covered of 35,000 miles. The Scottish club's planes averaged approximately 353 hours each; the Liverpool club, 331 hours each; and the Bristol and Wessex club, 320 hours each.

To Speed Up England-India Air Mail

IMPERIAL AIRWAYS has announced plans to accelerate air mail service between England and India. Beginning on May 16, air mail will be carried from London to Karachi in five days and two hours. The improvement in the schedule tends the ratification of permanent flying agreements with the governments of Greece and Italy and the introduction of new and faster flying boats on the Mediterranean sections of the route.

The present air mail route extends across Central Europe. However, on May 16 a change is scheduled to a route via Switzerland, Italy and Greece to Egypt. Mails and passengers will be timed to reach Alexandria, Egypt, two days and seven hours after departing from London.

The air mail and passenger service recently inaugurated by Imperial Airways from England to Central Africa will share in the improvement of the schedule, the air mail being retimed to arrive at Kenya Colony in six days.

Between Cairo and Karachi, speeding up in the schedule will be secured by the partial adoption of night flying, the airway being marked for a considerable distance by beacons and other night flying equipment.

The four-motored "Short" biplane flying boats, upon which the new schedule will depend, accommodate seventeen passengers and one and one-half tons of mail and have a high speed of 132 miles per hour.

GREECE

CONTRACT between a British aircraft company and the Greek goverment for the operation of an aircraft factory near Athens, Greece, was renewed recently for an additional period of seven years. The British company has maintained the factory since 1925, building 46 new planes and reconditioning 51 old ones for the Greek government.

ITALY

Plan Air Defense Maneuvers

A PROGRAM of aerial maneuvers in August with 600 planes participating, to test the aerial defenses of industrial centers, was approved April 2 by Benito Mussolini. All reserve pilots will be called for a month's training. Operations will cover a wide area in Northern and Central Italy. Anti-aircraft defense forces will coöperate in the maneuvers.

General Giuseppe Valle, chief of the General Air Staff, will be in command, with Air Minister General Italo Balbo supervising.

ROUMANIA

A MEETING of the Federation Aeronautique Internationale under the chairmanship of Prince Valentin Bibesco is scheduled at Bucharest, June 6-14. In conjunction with the meeting, the Royal Roumanian Aviation Club has organized an international air rally to take place on June 6. The rally will be open to all countries which are members of the F.A.I. and all types of planes whether civil or military will be eligible for competition in the events which are scheduled. Prizes will be awarded the winners of the various contests.

RHODESIA

Complete Aerial Survey

AN AERIAL survey of 63,000 miles of terrain in Northern Rhodesia has been completed in a period of four months. Daily flights were made in a Gloster biplane, which covered a total distance of 40,000 miles in 250 hours of flying time. A total of 20,000 photographs was obtained. Mapping of the country surveyed, which is being done in England, will be completed by June 1.

CZECHOSLOVAKIA

FOUR AIR ROUTES over German territory will be operated by Czechoslovakia, in accordance with a new aviation agreement effected recently between the two countries. The airlines which Czechoslovakia will be permitted to operate are as follows:

Prague - Dresden - Berlin; Prague - Halle-Muelhhaüsen-Rotterdam-Amsterdam; Marienbad-Leipzig and Prague-Munich-Zurich-Basel. The line from Prague to Berlin is a section of the Vienna-Berlin service and is operated jointly by the Czechoslovakian Air Traffic Company of Prague, the Deutsche Luft Hansa of Berlin and the Austrian Air Transport Company of Vienna.

Regular daily service on this route was to be resumed by the Czechoslovak company on April 1. It is planned to inaugurate regular daily services over the remaining two routes on June 1. The Prague-Basel airline will be operated jointly by the Czechoslovak company and the Swiss Ad Astra.

FRANCE

Set New Air Records

NEW world's closed-circuit distance record was established April 2 by the French pilots, Jean Mermoz and Anthoine Paillard, at Oran, Algeria, exceeding the record set March 1 by the French pilots, Boussotrot and Rossi. Flying on a circuit between Oran and Lasenia, North Africa, Mermoz and Paillard covered 9,145 kilometers (5,679 miles) in 59 hours and 14 minutes, according to unofficial figures.

Rossi and Boussotrot retain the endurance record. Mermoz and Paillard flew at greater speed and traveled 300 kilometers (180 miles) further than Rossi and Boussotrot, in 16 hours and 23 minutes less flying time.

Seven world's records were broken last month in a single flight by Capt. Joseph Le Brix and Marcel Doret. They remained aloft for 32 hours, 17 minutes and 48 3/5 seconds in a plane carrying a useful load of 2,000 kilograms (4,400 pounds). The flight established new records of distance and duration for planes carrying loads of 500, 1,000 and 2,000 kilograms, six in all, to which is added the record for speed on distance of 2,000 kilometers carrying 2,000 kilograms. They traveled a total distance of 2,915 miles.

New records for duration and distance over a closed circuit for light airplanes was established April 9 by two French pilots, Froton and Lavergne. They remained in the air for 29 hours, 38 minutes and 45 seconds, covering a total distance of 3,467 kilometers (2,153 miles). Their flight was made from the Istres flying field near Marseilles. The records were formerly held by the Italian Donati.

CANADA

FREE airplane transportation for Canadian prospectors wishing to work this year in the northwestern section of British Columbia and the Yukon, to be provided by the government, has been urged by the British Columbia Chamber of Mines. This service has been suggested in order to arrange for quick transportation into the area. By the usual means of transportation, it requires weeks or even months to get over the snow, or if prospectors wait until the ice breaks, they do not reach their destination until summer.

TRANSPORTATION of miners and supplies to mining areas in Northwest territories will be undertaken by the Spence McDonaugh Air Transport, Ltd., a new company organized with a capital of $100,000 and operating a fleet of six planes. Air transportation to any part of the Dominion will be offered. Head office of the company is at Edmonton. The company's planes will operate principally in the area north to the Arctic Coast and east to the Mackenzie River.

BUSY SUMMER FOR AVIATION IN CANADA

[JAMES MONTAGNES]

PLANS are being made for the Canadian Air Pageant to be held in July and August, and for a number of other air tours and flying club meets throughout the Dominion this summer.

One of the most important events will be the air pageant under the auspices of the Canadian Aviation League and the Canadian Flying Clubs Association, to promote public interest in Canadian aviation. This pageant will be in the nature of an air tour from coast to coast. Planes from as many flying clubs as possible will be assembled and will form a cavalcade which will tour from city to city, putting on flying exhibitions, parachute jumps, races and other field day exercises. Local associations will put on special meets when the aerial cavalcade arrives.

At Kingston there will be Eastern Canada

Air Meet June 2-3. Events on the first day will be open to club and amateur planes. Neighboring air clubs, Montreal, Ottawa, Toronto and Hamilton, will be represented. The second day of the meet all races and events are planned for professional pilots and parachute jumpers.

Montreal and Toronto flying clubs have scheduled field days, the latter having a garden party June 27.

In Calgary an air tour is being organized, the district to be covered being mainly the Western cities. This will make two air tours for the West.

Vancouver will open its new 460-acre airport July 1. The port is municipally owned and is a seaport as well as a landing field for landplanes. A 10,000-foot sheltered seaplane runway is one of its features. The port is on Sea Island and is planned to allow for manufacturing areas adjoining as well as a site for an airship mooring mast. The airport has cost the city $600,000 and has been planned to take care of future expansion, only a part of it being developed before the official opening. It will have four runways, the longest of which will be nearly one mile in length.

[F. N. DASHWOOD]

FRANK H. HARLEY and A. D. Rolfe of Saint Johns, N. B., announce the formation of Maritime Aircraft Construction and Supplies. The company has five patents pending on the Harley parachute, which they will manufacture, and is completing plans for a low-price light two-place plane. They will act as agents for aircraft equipment and supplies.

F. L. ROGERS of Saint Johns, is the winner of the essay contest conducted by the Montreal Light Aeroplane Club on the subject of the future of aviation in Canada. A trip to Montreal and return by air was donated by Canadian Airways as first prize.

MEXICO

[M. HURST]

THE PLANE, *Good-Will Ambassador,* made a trip to Mexico City in March after stops at Los Mochis, Mazatlan and Guadalajara. The tour was sponsored by the Chamber of Commerce of San Diego, Calif.

AN announcement has been made that in the future both private and commercial airplanes will be compelled to make stops on the Mexican side of the Mexico-United States border before crossing to the United States, British Honduras or Guatemala, so as to prevent them from carrying articles which are subject to duties.

APPLICATION has been made to the department of communications and public works from the newly formed Lineas Aereas Mexicanas for a concession to operate a Mexico City-Laredo airplane service.

A NEW lighting system has been installed at the central airport in Mexico City. A Sperry revolving beacon is used.

REGULAR plane service between Torreon and Mazatlan is now maintained. A twelve-passenger Bellanca plane, which was added to the C. A. T. equipment in February, is used.

THE Corporacion Aeronautica de Transportes (C. A. T.) has put a twelve-passenger Bellanca Airbus into service to be used principally in the state of Durango as a feeder for the airlines which run from Mexico City to Ciudad Juarez and from Matamoros to Mazatlan.

WORK of making a topographical map of the Republic from the air has been started in Mexico, with the mapping of the Pacific port of Mazatlan. From Mazatlan the airplanes will go to Tampico, Manzanillo, Veracruz, Ensenada and Guaymas.

VENEZUELA

TWO AIR mail and passenger transport services were established in Venezuela during the second quarter of 1930, one by an American company and the other by the French company, Companie Generale Aeropostale.

According to a recent report from Consul William K. Ailshie, Caracus, the French organization is the only aviation company operating in the interior of Venezuela. Until the end of September, 1930, it operated the following round-trip services: Maracay-Maracaibo, via Coro, 188 miles, and Maracay-Maturin, via Ciudad Bolivar, 388 miles. The section from Maracay to Coro, 153 miles, was flown on Tuesdays in one and one-half hours and from Coro to Maracaibo, 135 miles, in one and one-fourth hours. Return trips were made on Wednesdays. To fly the distance between Maracay and Ciudad, 294 miles, required three hours and from Ciudad Bolivar to Maturin, 94 miles, took one hour. Planes left Maracay for Maturin on Thursdays and returned on Fridays.

In all, 47 trips between Maracay and Maturin and 50 between Maracay and Maracaibo were made during April, May, June, July, August and September. Over 20,000 miles of flight were recorded between March and August. A total of 1,510,826 pounds of mail and 240 passengers, 25 per cent of whom were officials of the Venezuelan government, were carried during April, May, June and July. All aircraft operated by this company are landplanes with single motors.

There are 18 landing fields, divided into Class I, II and III in Venezuela. There is no manufacturing of planes nor engines in the country nor has there been any development of lighter-than-air aviation. The first aviation law was passed on July 30, 1930.

CHILE

Chilean Air Officials to Visit United States and Europe

THE CHIEF of the Chilean air forces, Commander Arturo Merino Benitez, will soon visit the United States, a formal invitation having been issued by the American State Department. Commander Benitz and two assistants, Capt. Dario Mujica and Lieut. Felipe Latorre will leave for New York on May 8 in a regular Pan-American Grace air mail plane. In the United States they will attend the annual maneuvers of the Army Air Corps and visit the principle airplane factories and services in the United States.

Commander Benitz and his assistants have been invited by the Prince of Wales as official guests of the British government to participate in an aerial exhibition at Hendon, England, early in June. It is expected that the inspection of American, British and Continental aircraft factories will precede further improvements in the Chilean air services and the acquisition of new materials.

Curtiss-Wright Plant Active

MORE than 100 employees under the direction of ten American shop foremen from the Curtiss-Wright factories in the United States are now at work in the company's aircraft factory at Los Cerrillos Airport, Santiago de Chile, building two-place Curtiss-Wright Falcons. Powerplants for the planes are imported from the United States, the planes being constructed entirely at the South American plant.

Factory building operations were inaugurated last October. By the end of April, ten airplanes will have been completed.

The chief supervisor and manager of the plant is Capt. C. S. Coen.

PERU

(H. GOMEZ-CORNEJO)

WHEN a general strike was recently declared in Lima and in the mining area of Cerro de Pasco, military airplanes from Las Palmas airport aided the authorities by spotting street mobs from the air.

Constant aerial observations were kept and excellent results were obtained in helping the authorities in this manner.

A NON-STOP FLIGHT from Santiago, Chile, to Lima, Peru, was completed on April 14 in sixteen hours by Elmar J. Faucett, director of the Cia. de Aviacion Faucett, S. A. and D. Tobin, pilot of the Curtiss-Wright staff. The entire distance is 1,800 kilometers.

ON A 'ROUND-THE-CONTINENT air tour sponsored by Pan American Grace Airways and affiliated companies, Leo Kieran of the New York *Times* and Ward Morehouse of the New York *Sun* arrived at Lima on April 3. They left on April 6 for the North on their way back to Panama and Miami.

GOVERNMENT authorities in Peruvian aviation are as follows: Ministry of Marine and Aviation, Commander Federico Diaz Dulanto; Inspector General for Peruvian Aviation, Colonel Juan E. O'Conner; Director of Civil Aviation, Commander Federico Recavarren; Sub-Director of Civil Aviation, Lieut.-Commander Carlos Zegarra; Director of the Military Air Base of Las Palmas, Commander Fernando Melgar; Director of the Naval Air Base of Ancon, Commander Carlos Zamudio.



THE FLYING AUTOGIRO MODEL

PRINCIPLES OF ITS DESIGN

By R. E. DOWD

IN the December, 1929, issue of AERO DIGEST we took up the study of boomerangs so that we might progress to a model autogiro, which appeared in the following issue of January, 1930. This article, in which the "Junior Autogiro" was described, has aroused a great deal of interest. In far-off Russia it was translated and reproduced in *Samoset* magazine. Readers have corresponded about their results, and some have asked about points which confronted them after making the model. This interest has been gratifying indeed and shows how alert are our readers to new developments.

Of late the Autogiro Company of America has reached a point in its development work where it is releasing engineering information and general publicity relative to its strange product. News-reels and the daily press have carried items of its astounding performances to the public in general. Now, more than ever, model builders will be interested in building miniature versions of the autogiro and entering competitions.

It is to be regretted that the explanation of autorotation contained in the January, 1930, Junior Activities section referred more particularly to the high speed condition wherein the "flapping" of the blades at their hub joints or, as in the case of the model, the bending of the thin blade at the hub, constituted the important feature of operation. Basically, autorotation as found in the autogiro is an aerodynamic phenomenon resulting from presenting certain pivotally mounted blade forms to the air flow at certain angles of incidence so that they draw the power for their rotation from the air reactions on the blades themselves.

Let's see if we can't make it clearer by a reference to the glider. Figure 1 shows a simple paper glider. It can be made in a few minutes. Perhaps we ought to make one to get the idea fixed in our minds better. All we need this time is a strip of ordinary letter or typewriter paper one inch wide by seven inches long, and a wooden match such as we find in the little boxes selling for a cent.

One edge of the strip of paper, 3/16 inch wide, is bent slightly down as shown in the drawing, and the other is bent up an equal amount. The match is split slightly and fixed to one edge. After some adjusting this will be found to glide at a very fine angle of about one in five or six. So far, this is nothing extraordinary. It is simply a tailless glider having a wing section that is stable in itself because of its form. Laterally, the stability will be slightly precarious, since there are neither fins nor dihedral angle, but with care it is entirely possible to make hand launched glides of 20 to 30 feet in a straight line. We mention this only in order that we may first have a highly successful glider to refer to in considering the action of the rotor blades.

Perhaps we have never thought much about how a glider really works. The analogy to a sled coasting down hill is more misleading than helpful, for the course of the sled is determined by the slope of the hill, whereas the glider cuts its way through the air following one of thousands of possible flight paths. Forces are at work; power is being used up; work is being done; but all under perfect control. It is not permissible in a compendium of this kind to introduce compositions or resolutions of forces at work when our glider model slides through the air across the room. Rather, let us simply point out that the air resistance to its flight path is being taken care of by the lifting force on the wing and this force is inclined *forward* enough to balance the drag. (See Fig. 1-A.) This is the result of the negative angle of the wing section to the horizontal. The great pioneer, Lilienthal, first discovered this and it has been called "Lilienthal's Tangential" because it acts tangent to the curved surface of the wing. If we could have this tangential force drawing our wings when they are at regular horizontal flying angles, we would have no use for an engine—our airplane would just fly on and on forever. It would be a case of obtaining "something for nothing" or perpetual motion. If we just keep in mind the picture of that glider flying across the room propelled against its own air resistance because its wing section is set at a negative angle, we are ready for the next step.



Don Gardner and one of his Autogiro models which has flown successfully

We must now make another model just exactly like the previous glider. This, too, must be perfectly balanced as a glider, using a match for ballast. Now let's take these two gliders and fasten them together at their wing tips with gummed paper or a portion of a gummed label. (See Figure 2.) We have now two complete balanced and tested gliders all set to go but facing in opposite directions and fastened together—we might say a pair of Siamese twins with their minds all made up to go on a trip, one north and the other south. What a mean trick to play on our little gliders, which have behaved so well when they were free to fly independently!

Now, let's drop our "Siamese Glider" just to see what it will do. Oh Boy! what a struggle! Around and around like dogs in a fight—each trying to glide away but instead being forced to circle about an axis. This is autorotation. Now if we force a pin through the exact center of the whole model and apply a touch of glue, and then bend the blades up at a slight dihedral angle we are ready for some more autorotation. The vertical descents are now even better than before because of the center weight of the pin and the upturned blades. If we string some beads on the pin so that the pin can turn freely, and gently move the whole system horizontally so that as the air strikes the lower surface we notice the blades revolve in the same direction as for the vertical descent. Here we are again one

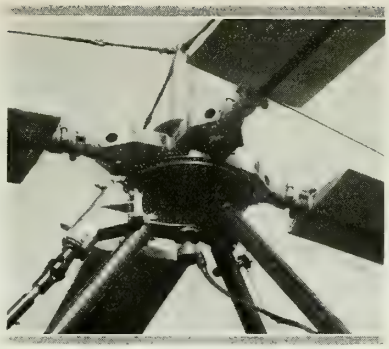
step nearer the autogiro, for we have autorotation with horizontal movement. Now we can change the upturned trailing edge of each blade to a downward turn, which will dispel any belief that the system is simply "windmilling" like any propeller dropped vertically. We can do this because we no longer need the upturned trailing edge for stability as in the case of the original glider.

Let us now turn to another experiment. Figure 3 shows a two-blade rotor made of a piece of wood, balsa or any light wood, about 3/16 inch thick by 2 inches wide by 36 inches long. It has a convex upper surface like a boomerang, but the lower surface is perfectly flat. As noted in our boomerang article, such a section is known as a paradox section because it will lift at zero degree incidence going in either direction. If we insert a tubular bearing at the center and mount it on a stick, we can again demonstrate autorotation. A wind of 10 to 15 miles an hour will rotate this shape briskly if it strikes the bottom or flat surface. An initial spin is necessary, of course, but once started it will continue to rotate. This form will work equally well turning in either direction. It is interesting to twist the stick through different angles as the blade rotates in order to feel the gyroscopic force.

Figure 4 gives us the practically symmetrical or double-cambered wing section known as Göttengen 429, such as is used on the large autogiros. It is also well suited to use on models. The point of attachment at the hub, however, should be pin-jointed horizontally in order to avoid the gyroscopic forces which we noted in the rotor of Figure 3 design. If this is done, the trouble with upsetting torque experienced with the "Junior Autogiro" (January, 1930, AERO DIGEST) will be eliminated.

Proposed Types

This time, rather than describe a certain type of model, we are going to offer sketches of proposed types, all of which should perform well. These designs have been checked over by Autogiro engineers and are pronounced feasible with some reservations for the canard design shown in



Rotor hub of Autogiro showing attachment of vanes to pylon

Figure 8. It would be very interesting to know how it would work out. Perhaps it has some basic advantages like the canard type of airplane.

Taking up the various designs in order:

Single Tractor—Figure 5 is a tractor monoplane. The rotor axis should be located about one-third from the leading edge of the fixed plane. The center of gravity will be at the same point, of course. The rotor can attach to the main plane and the rubber strands might better be under the fuselage stick to avoid interference. The propeller shaft could slope slightly downward so that the center line of thrust will pass through the center of gravity of the model. This is true of all designs shown.

Twin Pusher—Figure 6 shows a proposed design which should be excellent. The fuselage frame is a single stick "T" frame. By using twin propellers, the torque problems would be cancelled. The fixed plane could be simply a pair of balancing surfaces as shown, and the stabilizer, triangular like the Flemming Williams model. The fins should be high on all autogiro models because the c.g. is high, due to the weight of the rotor.

Single Pusher—Tubular Fuselage—Figure 7 shows a design which should be the most efficient of all. With a pusher propeller and enclosed rubber, with fins fore-and-aft, there should be some remarkable performances possible.

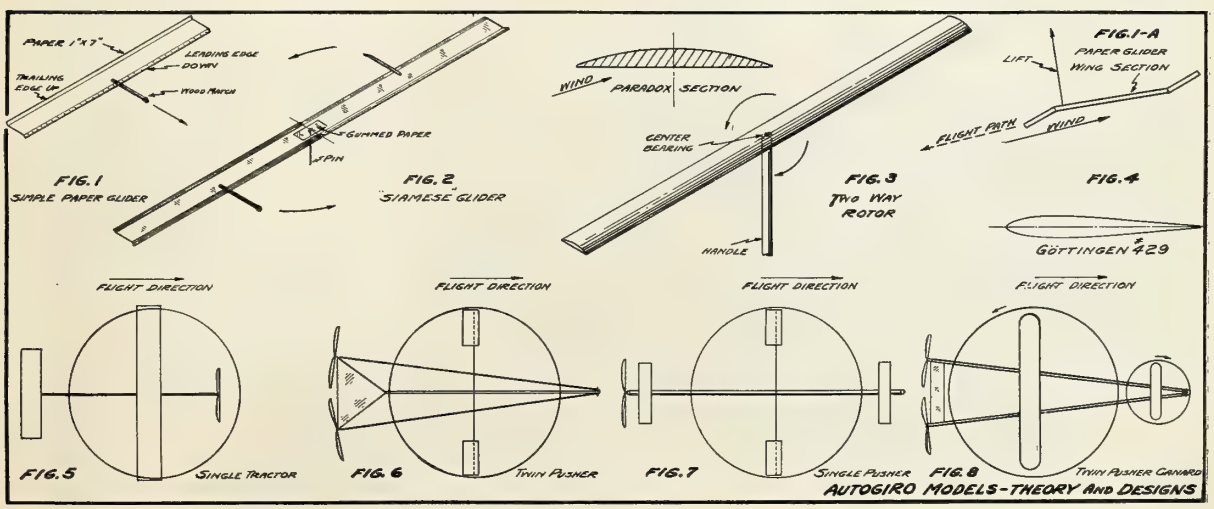
Twin Pusher "A" Frame Canard—As mentioned, this type may introduce some unforeseen difficulties. If the rotors were mounted at different elevations, their interference might be minimized. Also by turning them in different directions, we might expect some surprises in our tests.

Basic Design Data

Having several proposed designs and a suitable cross-section for the blade, as Göttingen 429, we can turn to some basic matters of design. First, let us suppose we plan to build the tractor shown in Figure 5. To begin we must assume a flying speed. This is easy, for we have made many model airplanes which would fly at walking speed or four miles per hour. Autogiros should be even slower, but if our construction should be slightly heavy, we might compromise on five miles per hour. With this assumption made we can arrive at our rotor tip speed, which will be, for good efficiency, about twice the forward speed, or 10 mi. per hr. In feet per second this is 14.667. The next thing to decide is the diameter of the rotor. This is a matter of choice. If we should assume 24 inches, we have for the circumference of our rotor circle 3.416 times 2 or 6.2832 feet. Now if our rotor tip should travel 14.667 feet per second, it must turn 14.667 divided by 6.2832 or 2.3 revolutions per second, or 138 revolutions per minute.

If we take all this for granted, what can we do to speed up or slow down our rotor's turning speed? That's easy, for reducing the angle of incidence of the blade *increases* the rotor speed, while increasing this angle *slows* the rotor speed just as in a glider. The correct angle will be very close to zero degree incidence.

If we now proceed with our model, allowing about 25 per cent of our total weight for rubber, and control our weights so that the model will fly at five miles per hour, which was our first assumption, we ought to have some pretty fine results. We recently learned that Don Gardner of the *Detroit News* has made a duration of over 60 seconds with a modelautogiro of his own design, weighing only ¼ oz. So let's get started.



RUN OF THE NEWS

(*Continued from page 49*)

I just tell him that he can't do it without a license. I'm not quite so clear in regard to the parachute regulations. They have something to do with packing the parachute, I believe, either before or after the jump. But in emergency I don't think I could be bothered. In any case, I make such a mess of myself in getting into a parachute that the jump would be practically wasted.

I hadn't intended to say another word about the Autogiro, but I must do so to sketch the outlines of what looks like a sucker game coming down our street. I give the authentic details, but no names or addresses, so that I can't be hung prematurely for libel. Some weeks ago there came by accident to my desk—and I do have a desk, too—an envelope and letter head beautifully decorated with printed matter. There was a picture of the world, no less, and across it a sketch of something as much like an Autogiro as possible without being one. The name thereof appeared to be the "Heligyro." So far, so good.

My carking curiosity immediately got the better of me and I went forth to buy me a heligyro. The Philadelphia address of the contraption turned to be a dud. It was a warehouse on an alley; furthermore it was deserted and padlocked. Not so good.

I pursued my investigations to an alternate address in another State. It turned out to be a bank, with no heligyrating going on that I could notice. I suppressed my unworthy suspicions, however, and wrote to both addresses for information, price lists and what have you. I affected innocence and a wistful and pathetic faith in human nature and heligyros. Nobody took the trouble to answer me.

There is a gentleman named Bradstreet who goes around poking his nose into people's financial and ethical affairs. I invited his opinion of heligyros and of those who do business with them. He didn't seem to think them so hot. The big shot in the heligyrating business declared a net worth of about $65,000 in early 1930. Six months later they wouldn't allow him more than $20,000. And six weeks ago he vanished into bankruptcy.

So I don't get my heligyro. Which is just too bad, for according to my letter and envelope the heligyro is the "safest in the world." You can't expect anything safer than that for the money.

This, friends and customers, is a true and faithful tale, and some of you may know more about it than I do. It isn't important, except that it seems to recall certain painful experiences of the past, when a choice lot of leeches attached themselves to a respectable industry and infected it with a mild attack of pernicious anemia. And do I remember correctly that once upon a time somebody got into a peck of trouble by misappropriating to his own purposes that revered and respected name of Curtiss? And that somebody else was caught in the act of marketing in the middle West a million dollars worth of shares in an airport to be located at the intersection of Broadway and the Hudson River, or thereabouts?

On the day that the Autogiro sat down softly on the White House lawn, Frank Hawks went to the other aeronautical extreme by socking another speed record in the snoot over in Europe. The implications of his performance are rather entertaining. He says he just had to do his stuff on the other side, for the reason that the average European can't get it into his head that New York and Los Angeles are not quite next-door neighbors and therefore is not sufficiently respectful to the high-speed achievements of American aviation. Frank Hawks is right, and if you doubt it you don't know your Europeans. On my occasional wanderings across the water, I sometimes mention over a glass of beer that I'm from Philadelphia and vicinity. Invariably there is somebody around to say that he has a second cousin living in Chicago or Saskatchewan or Sacramento and do I happen to know him? I don't.

And on the other hand, you and I are likely to think of London and Rome as the deuce of a distance apart. Mr. Hawks does not find them so. With a little better luck and some more gasoline—pardon me, petrol—he would have been back in London for dinner, where he had his breakfast.

The works of Charles Dickens are still popular with the reading public, which is a sign that in all essentials they are by no means out-of-date. But you will read in them that it was considered not long ago to be right smart traveling to go by fast coach from London to Brighton in two days. The distance is about sixty miles.

Speaking of speed, Postmater Brown has had an unexpected attack of optimism. He goes on record to the effect that eighteen-hour air mail and express service will be crossing the continent before this year is over. Frank Hawks won't think much of that, with a twelve-hour record for 2,510 miles of travel hanging to his belt, but it makes a pleasing comparison with recent figures for transcontinental traffic. In 1920 the best time across the United States was 74 hours by fast train. Eleven years later we are talking confidently of cutting that figure to less than a quarter. If this sort of thing goes on and on, what with daylight saving and everything, the traveler of tomorrow will be reaching places before he has left home, if you get what I mean.

It is reported that several of the biggest builders of aircraft will be adopting the five-day week for the summer and very likely for longer than that. But there's no cause for alarm. Very likely the aviation industry would be rendering itself and the neighbors a real and foresighted service if the manufacturers would agree among themselves that the forty-hour week is a cure for what ails us all. Five years ago I might have been shot for saying so. They would have shot Henry Ford for his five-day plan in 1926, if they hadn't been afraid of a shortage of spare parts for his popular product. But none other than Judge Gary called his scheme fantastic and the president of the National Association of Manufacturers quoted Scripture against it. And everybody agreed that the five-day week was impossible, incredible and dangerous because it would reduce production and create a labor shortage.

Nobody worries today about a labor shortage, unemployment having proved much harder to bear. Overproduction has become a fact, even in aviation. So the big arguments of the die-hards have been shot to pieces by the merciless drum-fire of hard times. And we begin to see that Henry was right when he said in 1926: "The short week is bound to come, because without it the country will not be able to absorb its production and stay prosperous." The Department of Labor admitted it in March, 1931, when it was reported that the plan was spreading everywhere in industry and that "the feasibility and economic soundness of the five-day week may now be said to have been demonstrated successfully."

Aviation is a comparatively compact industry and proud of its reputation for progressive policies and methods. The example of some of the brethren in instituting the five-day week in the shops deserves something more than suspicion. It would very likely be reckoned to aviation's enduring credit if its manufacturers would unite now in adopting

(*Continued on following page*)



A BRIEF two months ago Jim Membery, prominent citrus fruit grower of Winter Haven, Florida, had never been in an airplane. Yet the recreational possibilities of flying had appealed so strongly to him that he studied various types of planes for many months. After considerable investigation he decided to own an Aeronca because it combined all the features necessary to the enjoyment of flying—extreme safety, ease of handling, ruggedness of construction and economy of operation.

As soon as the ship was delivered he forgot about his oranges and, to the surprise of everyone, began flying alone—after only three hours of instruction.

Now Jim Membery is seen all over central Florida in his Aeronca. He flys from town to town for the pure exultation of it. He gets up early in the morning to greet the sunrise at 5,000 feet. He flies late in the evening —a time when the air is most quiet, the sky is most brilliant, and the urge to fly is practically irresistible.

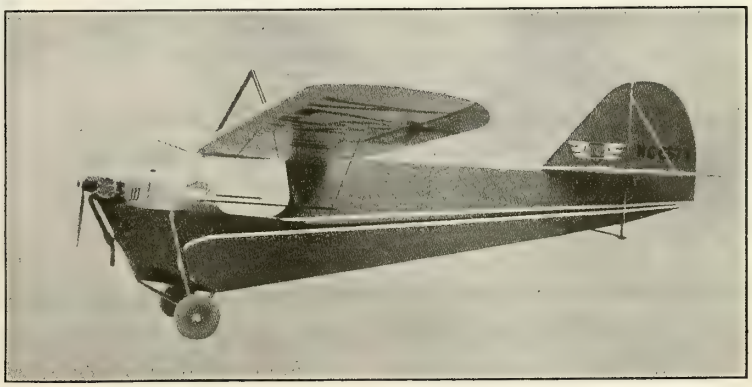
The above photograph typifies the exhilaration which this prominent Floridian derives from his indulgence in this new sport. While the water-bound racing boats hurtle most precariously over the thrill-creating skid, Jim sweeps smoothly along overhead, relaxed in pure enjoyment of the occasion.

Nearly 200 privately owned Aeroncas are furnishing equally varied and carefree pleasure to their owners all over the United States. To these enthusiasts flying has become the king of all sports, the keenest kind of recreation—a recreation vastly more enjoyable than anything they have ever tried, yet surprisingly devoid of any physical hazard. Best of all, the expense of this new sport is much less than that of owning a motor boat, a saddle horse, or even of belonging to a high-class golf club

Clubs of young men are pooling their funds to obtain Aeroncas. Sportsmen are using them in preference to their more expensive yachts, automobiles, or speed boats. Aviation schools are adopting them for training. In short, the Aeronca, which last year pioneered in the moderate priced light plane field, has established itself by a wide margin as the leader in its class.

Prices and details of the Aeronca single-seater or two-seater will be furnished promptly upon request.

AERONAUTICAL CORPORATION OF AMERICA
LUNKEN AIRPORT · CINCINNATI, OHIO



(*Continued from preceding page*)

the most promising principle in current economic theory—that the short working week is essential to security and prosperity, the greatest good for the greatest number, and a variety of other desirable conditions in a mechanized civilization.

A curious circumstance about this five-day week proposition, however, is that it only seems to work for the well-known working classes. The real executives in modern business are likely to put in a ten-hour day for six or seven days a week, and subsequently die at the age of 45 from nervous exhaustion. And an equally curious condition in aviation is the contrast between the comparative peace and calm that prevails today in the production departments, and the hectic pressure on the designing and drafting rooms. This, I am told, showed its results at the Detroit Show. The industry is further from standardization or even a family likeness in types of aircraft than it was ten years ago. We seem to be only at the beginning of the possibilities of aeronautical development in design, engineering and adaptation of aircraft to its commercial uses. In other words, "you ain't sen nothing yet."

Meanwhile, it is nice to be involved in a business that is going in the right direction, even though it has still a long way to go. If you will look over the records you will discover that transportation by rail lost a lot of passengers and freight last year, compared to previous totals. The bigger bus companies admitted the same sort of shrinkage. The automobile industry produced about 25 per cent of its previous output. Even bicycles and roller skates had a bad year.

But air transport increased its passenger totals from 165,000 to 400,000, and all other air business went up in approximate proportion. And late in April Postmaster Brown admitted to the Bond Club of New York that scheduled air transport will probably carry a million passengers in 1931. So if you feel like crabbing about hard times in aviation, remember that the facts in the case are sufficiently encouraging to give even a Postmaster General his moments of optimism. And before you sell short on the future of aviation, try to imagine how you might feel if you owned a railroad.

EDITORIALS

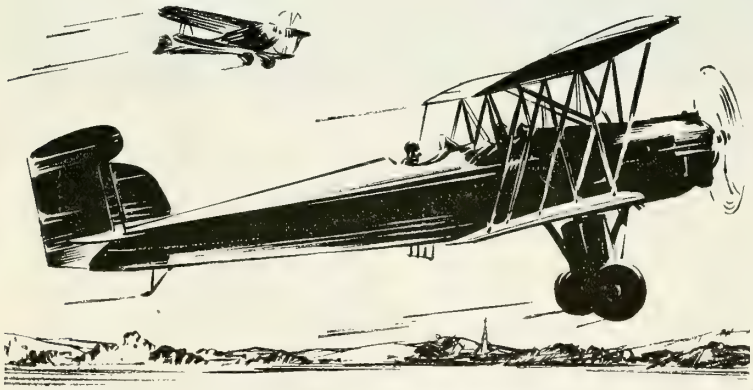
(*Continued from page 57*)

Much material for thought, here.

The Five Year Program said 1,820 planes by 1930, meaning fighting, serviceable and competent planes. Instead we have 600 odd and in order to get them the National Guard planes have been taken. The training planes of the Army Air School have been taken. Everything has been taken except Lindbergh's *Spirit of St. Louis* and Frank Hawks' *Eaglet*. If Orville Wright's original ship which flew at Kitty Hawks had been in the Smithsonian, where it should have been, of course, it too would have been drafted.

Wake up, taxpayers, before it is again too late!

(*Continued on following page*)



LEARN TO FLY

For Sport and Business

Curtiss-Wright Flying Service is the world's oldest and greatest flying organization. It is backed by 20 years of experience training competent pilots.

Over 3,600 students learned to fly in the nation-wide chain of Curtiss-Wright Flying Schools during 1930. Not a single student has ever been seriously injured in the famous Fledgling, training plane.

When you finish Curtiss-Wright training, you will be recognized by the Aviation Industry as an accomplished pilot. You will be given preference as an applicant for employment in all Curtiss-Wright activities. Mail coupon for free booklet.

WRITE FOR FREE BOOKLET

CURTISS-WRIGHT FLYING SERVICE,
29 West 57th St., New York City.

Please send me your new free booklet describing Curtiss-Wright Flying Courses.

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CURTISS-WRIGHT FLYING SERVICE, 29 WEST 57th STREET, NEW YORK CITY

Our facilities are at present
engaged in the production of the
new single engine ten place

PILGRIM Model 100

transport airplane, for delivery on a quantity order

and the

RANGER 6-390

six cylinder inverted, inline, air cooled engine

In producing these airplanes and engines, we are carrying forward the activities of the former Fairchild Airplane Manufacturing Corp. and Fairchild Engine Corp., thus continuing an organization long known for advanced design and fine craftsmanship.

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Manufacturing Division of The Aviation Corporation

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We have for sale several slightly used factory demonstrators of all FAIRCHILD open cockpit biplanes and closed cabin monoplanes in excellent condition at most attractive prices.

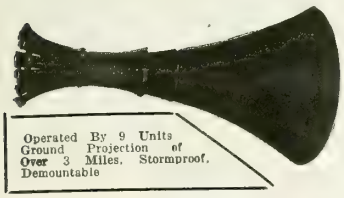
FULL INFORMATION ON REQUEST

AIR TRANSPORTATION MADE SAFER
With the RACON AIRPLANE SPEAKER



The above photograph used by courtesy of T.A.T.-Maddux Air Lines

Racon's Latest Improved
AEROPLANE HORN



Operated By 9 Units Ground Projection of Over 3 Miles. Stormproof. Demountable

For all outdoor use. This horn has been perfected after years of exhaustive research in Racon Laboratories. Will withstand all weather conditions. Guaranteed for one year. Requires no replacements or servicing after heavy rainstorms. . . .
Prices slightly higher than regular horns.

THE use of radio in aircraft operation is made doubly valuable with the new Racon amplifier. Air transport companies will find it of inestimable value in the safe delivery of passenger and express cargoes during bad weather. During recent tests in Chicago, in a snow storm, the voice was distinctly audible more than a mile away. No pilot or operator can fail to realize the import of establishing communication between the plane and the ground crew preparatory to landing when visibility is so poor that a safe 'set-down' is nothing more than a matter of good guess and plenty of luck.

FOR AERIAL ADVERTISING

Through the Racon Airplane Speaker the broadcaster's voice can be heard for miles. Even though the plane may be hidden in the clouds, the voice—or music—can be heard above the din of city traffic. During the Chicago tests music was broadcast from a phonograph record and was heard very clearly several miles away.



NEW MASTER UNIT

Continuous Operating Capacity 6-8 Watts. Peak Load Capacity 25 Watts
List Price $75

The Racon Airplane Speaker was designed for airplane or airport use. It is very light and compact and was built to withstand rapid changes in air pressure. Instead of the usual dynamic unit, the Racon horn is equipped with four apertures, utilizing four Racon Giant dynamic units. Consequently the Racon horn has four times the ordinary volume.

Racon horns and units are covered by U. S. Patents Nos. 1,507,711, 1,501,032, 1,577,270, 73,217, 73,218, 1,722,418, 1,711,514, 1,781,489



Giant Electro Dynamic Horn Unit. Continuous Operating Capacity 7-10 Watts. Peak Load Capacity 25 Watts
List Price $100

Write for complete description and price.

RACON ELECTRIC COMPANY, INC.

18 Washington Place
New York City

Toronto, Canada — England

(Continued from preceding page)

"BILL" MAYO

THE patron saint of American aviation in certain of its phases, is "Bill" Mayo. It was through him, then an important official in the Ford Motor Company, that Henry Ford became interested in and finally purchased the Stout Metal Airplane Company, putting his vast, resources behind the development of practical airplanes to do actual work.

It was under William Mayo's inspiraiton, also, that the first exclusively passenger airline in America was started, and he inagurated the world's first wholly freight-carrying airline. Ever since, these wonderful facilities have operated ceaselessly, with an astonishing record for safety and efficiency. The freight planes have borne, to date, more than ten million pounds of Ford material, of one kind or another, in inter-service between Detroit, Chicago, Cleveland and Buffalo, to say nothing of much longer flights upon occasions.

At the time that the first exclusively passenger airline was started under William Mayo's guidance, a group of notables gathered in Detroit and were stirred by his enthusiasm to creat in th offices of the Ford Airplane Company a new organization for the carriage of Air Mail. It was christened National Air Transport Company, and was one of the first commercial organizations to take over an Air Mail contract.

Nor did this wonderful man, Mayo, confine his efforts to his own city of Detroit Detroit. The organization of the Western Air Transport at Los Angeles, also was fostered and assisted by this far-sighted man. He was represented at the original meeting and invested his personal funds in the young enterprise.

William Mayo's work, moreover, has been singularly without thought of his own profit. He has given the welfare of the industry the greater portion of his genius. The experimental work now being carried on under his direction will not be exclusively or even principally for the benefit of those enterprises with which he is personally associated, but for the welfare of that industry which serves human flight, in which unquestionably, he is one of the outstanding geniuses.

After the Ford purchase of the Stout Metal Airplane Company the development of the trimotor ships and other experimental work has been entirely under William Mayo's business supervision and today the Ford trimotor transport planes occupy a position recognized by every operator in the world.

When he passes on to his reward Henry Ford will leave behind him many evidences of his genius. None will be more striking than the record of the fact that he gave William Mayo his great opportunity.

For a few years, indeed, nearly every successful airline in the country had Mayo's name upon its board; all work to this day under his close advise and counsel. If American Air Transport has a father that father is named Mayo—William B.

A DESIGNERS IMPRESSIONS

(Continued from page 45)

on the dash. When flying speed is lost the pointer moves into the red. Which is not unusual these days. This device no doubt will aid students in getting the feel of the ship in the air but may not be so valuable near the ground. At these times the pilot's eyes are outside of the ship——in taking off or landing—when stalling is dangerous. usually upon the horizon—and the majority of pilots prob-

(Continued on following page)

AIRPORTS THAT PILOTS HEAD FOR



CONTINUE ON TO AIRPORT
SAFE LANDING—GILMORE SURFACED

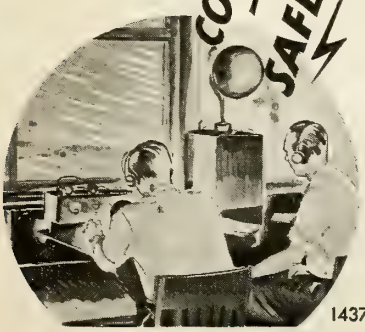
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Callies Airport, Los Angeles, Cal.
Clover Field, Santa Monica, Cal.
Lindberg Field, San Diego, Cal.
Aero Corporation of California
North Island, San Diego, Cal.
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The best recommendation an airport can have is the confidence of dispatcher and pilot in foul weather operations.

Airports with take-off runways and landing areas surfaced with Gilmore special asphaltic Airport Oils not only provide the maximum of safety—but the low cost of installation and freedom from maintenance expense makes them the most economical.

Let Gilmore engineers show you how your airport can be made the constant port of call of experienced and careful aviators. Gilmore Oil Company, Ltd., 2423 East 28th Street, Los Angeles, California.



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GILMORE
Special Asphaltic
AIRPORT OILS

FLY *with* CHAMPIONS



When you think of spark plugs one name stands out from the rank and file.

That name is Champion — not only a name, but also a fact.

For the past two decades only the best of engineering has survived. During this period the preference for Champion spark plugs has constantly grown.

They have been the choice as original equipment on the majority of motor cars of the world. They have enjoyed the preference of the majority of individual motor car owners.

Champion Aero Type spark plugs incorporate all the time-proved and exclusive Champion advantages, and are specifically built to render better performance in aircraft engines.

The unique design of Champion Aero Types affords practical immunity from pre-ignition and fouling. In addition the dual insulators of Champion sillimanite—not porcelain—are so constructed that engine operation positively cannot be interfered with, even in the remote possibility of breakage.

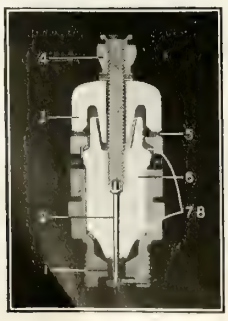
Fly with Champions, for their championship performance is traditional, and eloquently borne out by the fact that they continue year after year to excel and outsell throughout the world.

New Improved

CHAMPION

Spark Plugs for Aviation

TOLEDO, OHIO **WINDSOR, ONT.**



Champion Aero A Exclusive Features

● **1. Restricted bore. 2. Special analysis electrode. 3. Secondary sillimanite dome insulator. 4. Welded steel terminal. 5. Copper seal. 6. Primary sillimanite insulator. 7-8. Molded copper gasket seals.**

(Continued from preceding page)

ably will prefer to trust their own judgment than take the trouble of repeatedly changing both direction and focus of their eyes as this instrument requires. The Elgin Company at present is working on a stall warning device that promises to surmount the difficulties mentioned. The same company had on exhibition an improved compass of simplified construction and considerably less weight. Other interesting accessories were a new brake wheel by the Variety Company; simplified navigating lights by the Waco Company; and a trick duplex foot pedal by Consolidated.

Novel details included a button throttle control in the brake lever of the Swanson; a two-part aileron with individual piano hinges, on the Northrop; clever foot pedals for the passenger's control in the Waco coach, which automatically disconect when kicked back against the floor; pedal covers on the Curtiss-Wright Junior, hinged in place and designed to prevent passenger from jamming the rudder; and a neat instrument board arranged on the Verville, the panel being bent into approximate thirds and the outer sections brought rearward about 30 degrees. Alumium Company of America, Dow Chemical, Goodyear-Zeppelin, Aircraft Products, Ex-Cell-O and many others contributed improvements in metal construction and the manufacture of precision parts.

A trend toward more economical construction was observed in the increased number of castings; the use of all metal control surfaces; and the interchangeability of parts —wing panels, tail surfaces, undercarriages and so forth— on related models, such as offered by Consolidated and Waco. Controlability was sought by balancing of elevators and ailerons as well as rudders. It is rather amusing to observe the trouble some manufacturers take to balance the ailerons, completely overlooking the economical and thoroughly satisfactory paddle type balance. Surprising too that light plane manufacturers do not discard fixed tail surfaces entirely. Increased comfort was noticed in roomier cockits; larger and more comfortable seats, occasionally adjustable; foot rests; and larger doors and windows.

Little appears to have been accomplished however, along structural safety lines, during the past year. Many crude details of construction are in evidence—eccentrically loaded control horns of flimsy sheet construction, for example. Much remains to be accomplished in the provision of adequate visibility, particularly aft and above, and in simplifying controls, at the same time removing columns and other exposed members from the cockpit. Crash rolls on all instrument panels and seat cushions of a size interchangeable with chutes are minor, yet worthwhile, considerations. Likewise, a satisfactory exhaust silencer. The manufacturer who leads the way in reducing the nervous strain due to this cause probably will be well paid for his trouble.

No exhaustive (and exhausting) survey of the air show could be complete without mention of another welcome trend of affairs. Sikorsky led the way by adopting exceedingly fair means to attract attention—in the person of a charming hostess. This year the State of Texas seconded the motion by sending a devastating blonde exhibit of charming personality. Even the most superficial study of this tendency clearly indicates that, if not checked, gate receipts at subsequent shows will probably be larger, and fewer airplanes sold—no salesman being equal to this sort of competition for attention. Which, after all, is perfectly acceptable to one who goes in on a pass and can't afford to buy a plane.

If the pilot is your prospect

READ THIS LETTER

JOHNSON AIRPLANE & SUPPLY CO.

THE AERONAUTICAL SUPPLY HOUSE

DAYTON, OHIO

April 25, 1931

Aero Digest,
220 West 42nd St.,
New York City, N. Y.

Gentlemen:

During the Detroit Air Show, I was associated with the Variety Manufacturing Company in showing their new line of Airplane Wheels and Brakes.

Mr. DeBeuckelaere, President of the Variety Company, stated that he first wanted to advertise in a magazine that was read by pilots. Therefore, I suggested asking the next six pilots that passed our booth this question: "What aeronautical magazine do you read as first choice?"

It will of course be interesting to you to know 100% of the pilots who were asked that question, stated "Aero Digest". Therefore, readers of "Aero Digest" will learn more about Variety Wheels and Brakes for airplanes.

Very truly yours,

JOHNSON AIRPLANE & SUPPLY CO.,

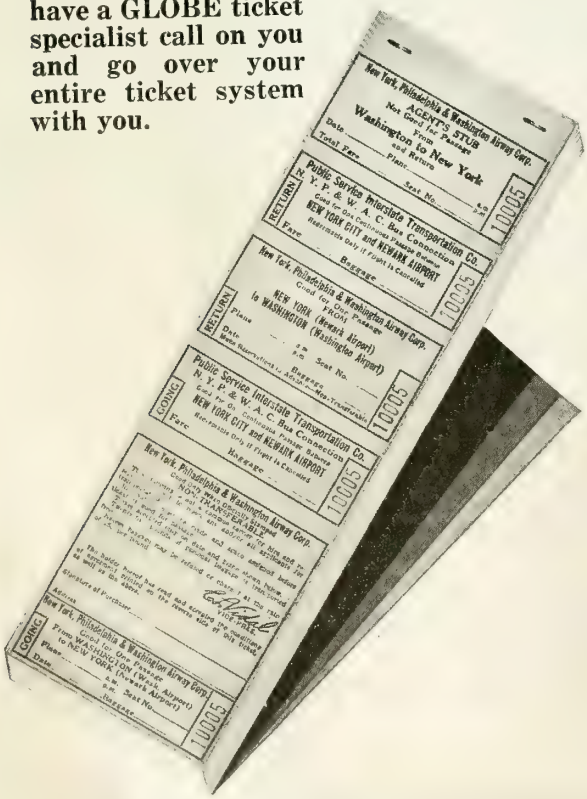
E. A. Johnson, President

EAJ/IB

AIR-TRANSPORT LINES, too, Turn to GLOBE

GLOBE'S half-century of experience in planning economical and efficient ticket systems for railroad and street lines is proving valuable to aviation companies operating ships over regular scheduled routes. GLOBE planning and GLOBE accurate numbering facilitate the handling of passengers, make accounting easy and assure perfect control even when ticket pads (as is often desirable) are supplied to many agents in hotels, bus terminals, etc.

Stock tickets or special forms printed on GLOBE protective tints. Low prices because of GLOBE quantity production. Write nearest office for samples and prices, stating quantity used. Better yet, have a GLOBE ticket specialist call on you and go over your entire ticket system with you.



GLOBE TICKET CO.

Main Office and Factory

112 North Twelfth Street Philadelphia

Additional Offices with Factories in

Boston New York Los Angeles Atlanta

Sales Offices

Baltimore Cincinnati Cleveland Pittsburgh

Syracuse Des Moines St. Louis

AIR—HOT AND OTHERWISE

(*Continued from page* 53)

the counsel of those who were in a position to anticipate the general reaction of a racket of this sort upon the industry. It went ahead with calm and terrible stupidity.

It was natural that a show operated by a group possessing animating impulses of this sort should be a disastrous failure. Even the racketeering program was a sad financial flop.

The balance sheet of the Aeronautical Exposition Corporation for 1930 now available shows that this brief adventure along the silly byroads of unintelligence cost the stockholders just $2,946.50. This was not the deficit of the show. Oh, Lord, No! Would that it were. Just the program—$2,946.50 thrown away.

Note, of course, that my statement is it "cost the stockholders." The loss did not in any way affect the salaries of those running the Aeronautical Chamber of Commerce.

For such things as this we, the members who neglect the Chamber (we, who, in other words, neglect our own affairs) must pay; the men employed to manage them, of course, lose nothing. The general manager of the Chamber gets his thousand dollars a month. Nice, in these grim days of apple-selling on street corners. Twelve grand a year, with programs on the side, constitutes an almost really first-class racket. Nothing to tempt Al Capone, perhaps, but better than those involved could get from anything else that they would have the gumption to do.

Gentlemen, it would seem to me (at least in these dark days of dolorous deficits) that the affairs of an organization which spent $109,752.63 of our own money last year, should be worthy of our personal, individual and collective study and unanimous, carefully thought out approval.

It is my opinion that much of the large sum was wasted. Members of the Chamber, proper attention paid to the business would have avoided many needless expenditures. How much attention was the matter really given? I'll tell you. Twenty-five out of the actual membership of 743 were at the anuual meeting on January 29th.

There's got to be a *Cure* . . . or shall we placidly accept a pauper's grave? It won't cost much to paint the letters A. C. C. upon a simple, soft wood cross to drive into the cold, cold ground of Mr. Potter's well-known field.

HIGH LIGHTS AND LOW LIFES

(*Continued from page* 52)

We must compliment the Goodyear-Zeppelin Corporation for producing a dirigible so huge and so safe looking that even our old line admirals may be induced to go up in it, and acquire first hand information about how insignificant and slow and helpless a battleship really looks to a bombing pilot. If the new *Akron* will only accomplish that feat, we may immediately write off its cost during the first week, as money well expended for value received. You know, our problem always has been to get these old moss-backs up, and the *Akron* looks like the answer.

My old friends, W. T. Van Orman of the Goodyear-Zeppelin Corporation and the notorious Shorty Fulton, Manager of Akron Municipal Airport, were so insistent that I journey to Akron to see this monster in course of

(*Continued on following page*)

RICHLUBE

100% PURE PENNSYLVANIA MOTOR OIL

—is approved by every major aircraft engine manufacturer in the United States!

Richlube *earned* this sweeping endorsement by outstanding quality. Made in Richfield's own refinery in the heart of the Pennsylvania crude district, Richlube is *straight-run* Pennsylvania. *It is not blended in any way with cheaper stocks!*

Richlube has been used in many of aviation's greatest achievements. It is used in the planes of leading air transport lines. It is endorsed by Anthony Fokker, dean of airplane builders. All this—is added proof that you cannot buy a finer oil for your plane than Richlube.

Try Richlube the next time your ship is being serviced. Available at important airports both east and west of the Mississippi River.

RICHFIELD OIL COMPANY
LOS ANGELES · NEW YORK CITY





The Amazing Life of "TONY" FOKKER

"GOD made the world, but the Dutch made Holland." Tony Fokker, who built and flew a plane before he ever saw one in the air, who started at 19 and became a multimillionaire at 28, might have blazoned that motto on his shield. This *enfant terrible* of aviation, a temperamental enigma to friend and foe, has had one of the most amazing careers of any living man.

•

FLYING DUTCHMAN is a thrilling and important chapter in the history of aviation. We ride on German patrols with Richthofen, Boelcke, Immelmann, in Fokker's deadly "flying razors", we see him discover the principle of "inherent stability", we watch him invent the synchronized machine gun *in 48 hours* and we follow with fascination the action, intrigue and incredible achievements that have marked the career of this aircraft designer extraordinary.

•

Fokker's book is illustrated with many of his own remarkable photographs. If your bookstore does not have the book send the attached coupon, filled in, to the publishers.

•

FLYING DUTCHMAN

THE LIFE OF FOKKER

BY ANTHONY H. G. FOKKER and BRUCE GOULD

Foreword by EDWARD V. RICKENBACKER

HENRY HOLT AND COMPANY
ONE PARK AVENUE, NEW YORK

Enclosed find ☐ money ☐ check for which please send me_____cop____ of FLYING DUTCHMAN, at $3.00 the copy (add 15c to cover cost of mailing).

Name_____

Address_____

(*Continued from preceding page*)

construction, that I rushed some personal matters, hunted up Akron on the map, and found it was hidden away on a branch line of the Pennsylvania R. R. I'd have flown over, only the Pullman Company and I are hard at work trying to get back my standing in the league of coming executives—there are some going ones in that league, too, and several who are gone, I hear.

Anyhow, I saw this new Zeppelin and was amazed and delighted to see the advancements over all previous designs. I suppose that I have the standard airplane pilot's feelings about lighter-than-air developments, built up from a foundation of six months on a Home Defense Squadron against Zeppelins in England during 1917—no, I didn't shoot one down, and never saw one during the war except from the ground in London. I had one ride in the old English dirigible No. 9—it would be unfair to the Count to call that thing a Zeppelin—and I had another ride in the N. S. 11, that blew up and was lost with all hands in the North Sea on its very next trip; also I had one flight, a sort of insane hedge-hopping stunt ride, with an odd character named Tookey Jones in a blimp at Cranwell. All of which, I realize, was a poor introduction to the lighter-than-air business, and not calculated to dispose me favorably toward the art. But I believe this new Zeppelin opens up greater possibilities for this form of craft than most of us have deemed possible. Of one thing I am convinced. Flying in it is a hundred per cent safer than riding over the hills around Akron Airport with that demon driver of Ford sedans, the notorious Shorty Fulton. When he approaches a ditch, Shorty merely pulls back on the wheel and zooms it, and as for a tree, it's simply an indication to him that his next move should be a vertical bank followed by a snap roll.

Well, I could run along like this for page after page, for there is much to tell, but I must restrain my impulse with the thought that after all the basic idea of a magazine is to leave plenty of room for advertisements. If it wasn't for the good old advertiser none of us could have anything published, because it is the advertiser—bless his heart!—who pays the freight. May his tribe increase and flourish like the green bay tree. And may I just sneak in between a couple of his ads for a few more words?

In the interests of fire prevention at the Show, the management went to some expense in hanging NO SMOKING signs all over the hangar, though most of them were hung so high you needed a telescope to see them, and the City of Detroit sent many firemen there to enforce the rule. They might have saved their money, because apparently nobody believed in signs or paid any attention to the firemen. I obeyed the rule conscientiously until I noticed that I was becoming conspicuous—I believe that some small boys and myself were the only ones who were not smoking. So just not to look too odd, I finally lit up and make a smoke screen with the rest of them.

We'd better take ourselves seriously on that NO SMOKING business, because if not, sooner or later we're going to have a sorry experience at one of these shows—it happened before, at a Los Angeles automobile show. Don't forget that empty gas tanks still hold high test gasoline vapor that easily may be ignited. They have a wonderful fire protection system in that Detroit hangar, but it's up against a lot of competition from inflammable airplanes and irresponsible and careless smokers. We aviation people may feel that we're very careful ourselves about matches and cigarettes, but we ought to recognize that the general public cannot be expected always to exercise

(*Continued on following page*)

Do You Intend to Be a Pilot?

●

Then investigate this less expensive, safer and quicker method of flying instruction

●

THE new Solofly System of Flying Instruction was developed after much study and experiment by Lieutenant George Rockwell, former flight instructor in charge of Field 2 at Issoudun, during the World War. It has been his experience that students taught the feel of the controls and automatic coordination before going into the air become far better pilots than those forced to assimilate the instruction while flying in a dual controlled plane.

SOLO · SYSTEM · OF · FLYING · INSTRUCTION

SOLOFLY

LEARN TO FLY SAFELY, SURELY STEADILY — ADVANCE WITH CONFIDENCE STEP-BY-STEP

Patents for equipment applied for.
Entire system copyrighted by George Rockwell.

FOUR UNITS

The COORDINATOR teaches the student the feel and coordination of the controls, on the ground. The TAXIPLANE, which is just like a regular plane except that it has insufficient wing area to permit its leaving the ground, teaches the proper handling of a plane while taxiing and taking off. The GLIDER gives the student his first actual lessons in operating the controls in the air and in landing. The SOLOPLANE gives him his first taste of flying a powered airplane. An instructor accompanies the student pilot on his first hops merely to determine whether he is capable of going aloft alone. When the instructor is satisfied on this score, the student is permitted to solo. From this point on his future in aviation begins to take form.

LOW PRICE A BIG FEATURE

Only $215.00 for a complete Private Pilot's Flying Course, including 10 hours of Solo Flying as required by the Department of Commerce. Easy terms if desired, at slightly additional cost.

ENROLLMENT CLOSING RAPIDLY

Because the Solo System of Flying Instruction offers the student much that he cannot obtain through other methods of instruction, particularly at such low cost, our enrollment lists are filling up fast. Next enrollment begins May 15th and June 1st. For further details send the coupon below today.

(SEE THE SOLO SYSTEM UNITS IN OPERATION AT GLENN CURTISS AIRPORT, NORTH BEACH, L. I.)

MAIL TODAY

LIEUT. GEORGE ROCKWELL, Pres.
Solo System of Flying Instruction, Inc.
1780 Broadway, New York City

I should like to receive **right away** the complete story of Solo System training, easy payment plan, time required to complete training, advantages of your method, etc.

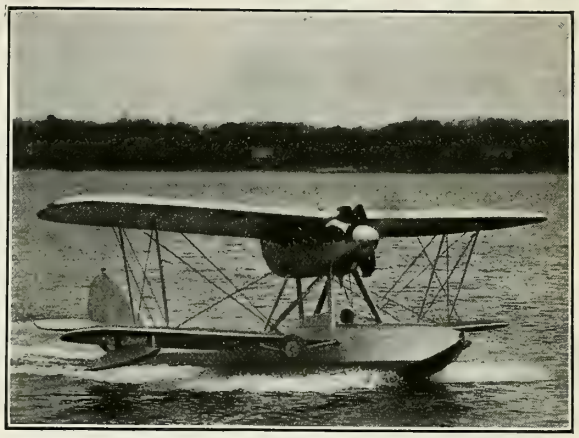
☐ I should like also to make a personal visit to your school rooms to talk things over. Schedule my visit for.....[date].

Name..... Age.....

Address.....

City and State.....A.D.531

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TO A DEALER

who is

"PROFIT-MINDED"

Here is an amphibion with *performance.* The fastest amphibion of its power, it gets off the water with three people in 12 seconds, climbs 700 feet a minute, performs every maneuver with enthusiasm, and operates for only a few cents a mile!

There are scarcely-touched possibilities for profit in the use of amphibions for passenger flying and student instruction, and a rapidly-growing preference for amphibion safety and convenience among owner-pilots. The new Savoia S-31 is finding wide favor among hard-headed dealers with an eye to profits. Shall we tell you more about it?

AMERICAN AERONAUTICAL CORPORATION
PORT WASHINGTON, N. Y.

Write for information about flying boat and amphibion instruction

AMERICAN

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A GOOD INVESTMENT

for Business or Pleasure



LOWEST PRICED AMPHIBION IN THE WORLD

$5,800... PRIVATEER!

PRIVATEER'S economy of operation and remarkably low price of $5,800—several thousand dollars lower than that of any other amphibion in the world—mark it as an outstanding investment for the three great air-minded classes, flying schools, salesmen and sportsmen.

Rugged of construction . . . smart in appearance . . . the two-place open cockpit monoplane PRIVATEER (A. T. C. 370) is designed and manufactured by pioneer makers of amphibions. In stiff tests it has shown unusual stability, ease of control and maneuverability . . . and its adaptability to landing condition—snow, ice, rough terrain and water considered—has amazed experienced pilots. Flying range adequate for all reasonable needs . . . motor parts extremely easy of access.

A dependable Warner "Scarab" motor of 110 h. p. provides a high speed of 95 miles per hour . . . a cruising speed of 75 . . . a landing speed of 41 . . . a climb of 650 feet per minute . . . a cruising range of 250 miles. All this with a useful load of 600 lbs.—performance aplenty.

Naturally, because it is ideally suited for the use of the three great air-minded classes, dealers who sell the PRIVATEER have entry into a vast market. Just as the purchase of a PRIVATEER is a good investment for its owner, so is a territorial appointment for distribution . . . for Amphibions, Inc. dealer policy provides a liberal profit on each sale.

For complete information concerning the territorial appointments that are now being made, write or wire

PRIVATEER
$5,800 (Fly-away at Factory)
A. T. C. 370
Weight Empty, 1350 lbs.
Gross Weight, 1950 lbs.
Standard Equipment
Warner "Scarab" 110 h. p.
Paragon Pusher Propeller
Heywood Injection Starter
Low Pressure Tires
Fuel Level Gauge
Tachometer
Oil Thermometer
Air Speed Indicator
Altimeter, Tools, Anchor
Rope, Cockpit Cover
Fire Extinguisher

AMPHIBIONS, INC.
GARDEN CITY NEW YORK

(*Continued from preceding page*)

care.

Why not put an iron-barred enclosure in the center of the hangar next year and appoint someone to act as judge with power to sentence our own aviation offenders to five minutes in the bull-pen for each offense? Not the public—just our own crowd, you know. Hang up a sign: "This MOUSE TRAP is set for aviation people who break the NO SMOKING rule." I really believe that you can kid people into obeying sensible rules, when no amount of column admonishing would force them to do so. It's worth a try, anyhow. But come to think of it, as I'm such a confirmed smoker that I do it almost subconsciously, I might even get caught in my own mouse trap and have to spend five minutes in the darn thing myself!

THE INDUCED DRAG

(*Continued from page* 61)

very high one, that the drag of an airplane becomes extremely large; in the one instance, it is the induced drag that is very large and in the other, the friction drag. The maximum speed of airplanes, therefore, is chiefly governed by the friction drag, but their best climbing and ceiling performances are governed by the induced drag. Cutting down the span, without diminishing the wing area, (the chord becomes correspondingly larger) diminishes the climbing and ceiling performance, but hardly the speed. The smallest drag of an airplane takes place under conditions where both the induced drag and the friction drag are reasonably small; that is, at a medium velocity, neither too small nor too large. Such medium velocity is, therefore, the flight of smallest fuel consumption per mile.

The existence of an induced drag as such, entirely naturally explained by obvious down motions of the air under the gravity of the airplane and consequent energy requirements, is the broad principle to which this article is devoted. No vortices, vacua, circulations or any other difficult and vague conceptions are necessary for the explanation and for the computation of the induced drag. In the following articles, we shall discuss the effect of the lateral downwash flow on the lift itself, and will then be prepared to take up immediately practical applications of the theory to design problems.

(*This is the eleventh of a series of articles by Dr. Max M. Munk. Copyright,* 1931. *All rights reserved by the author.*)

NAVIGATION IN GROUND SCHOOLS

(*Continued from page* 56)

—Horizontal and vertical force—Principles of construction of magnetic compasses—Fitting and care of compasses. Deviation, causes and effects of—Compass compensation—Determination of deviation in the air by means of amplitude and azimuth tables—Preparation and analysis of deviation tables—Approximate coefficients—Deviascope.

Flight by Dead Reckoning

Course (true, magnetic and compass)—Track (true and magnetic)—Drift—Measurement of air speed and ground speed—Units of speed—Triangle of velocities—Methods of solution for determination of drift—Course—Ground speed—Wind speed and direction—Radius of action—Drift indicator—Navigational instruments—Ordinary slide rule—Use of instruments for calculating problems on triangle of velocities—Determination of position by means of transits and bearings.

(*Continued on following page*)

NATIONAL MODEL CONTEST

DAYTON, OHIO

FOUR CONTESTS—*Every young man under 21 may compete for one or all four prizes*

FOUR model airplane champions will win free airplane trips to Washington, D. C., this summer as the guests of the Ford Motor Company. They will be selected at the Fourth National Airplane Model League of America Contest to be held in Dayton, June 29th and 30th. To enter these contests you need only to join the A. M. L. A. and arrange to take part in the National Contest—and build a better flying endurance, fuselage, or scale model than anybody else.

There will be banquets, the champions' trip in a Ford trimotor to meet the President at the White House, sightseeing in Washington, and the return trip by airplane to Dayton.

Mark the dates on your calendar—June 29th and 30th! The cost of the trip is small, less than $15 above your railroad fare.

For full particulars write

Merrill C. Hamburg, *Secretary*, A. M. L. A., 300 Davis Avenue, Dayton, Ohio



REAL AIRPLANE PROPELLERS

ONLY $1.98

I just located a thousand new war time propellers. The price was low. I bought. Now you can buy these real airplane propellers 8 feet 6 inches long from tip to tip for the extraordinarily low price of only $1.98 each. Mount a clock in the centre! Hang them in the den! Put them over the fire place! A real ornament that becomes more valuable as time goes on. They won't last long. Act now.

Pin two dollar bills to this coupon and mail today, I'll do the rest.

KARL ORT, Propeller Dept., YORK, PA.

DEAR ORT:

Please send me ..... new OX5 propellers at $1.98 each.

Name .....

Street .....

City ..... State .....

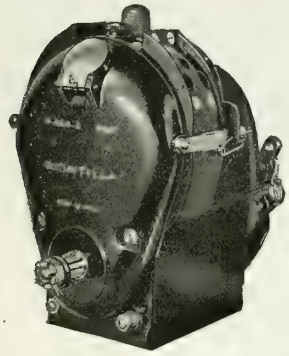
These propellers are not to be used for flying.

Send this coupon and one dime and I'll send you a list of my other aeronautical bargains.

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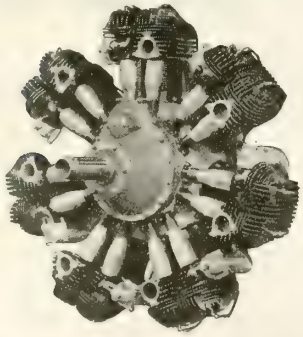
helps set another record



Like other leading builders of aircraft engines, MacClatchie Manufacturing Company finds dependability and satisfaction in Scintilla Aircraft Magnetos.

The "City of Los Angeles," recent record-breaking plane, is powered by a MacClatchie "Panther," Scintilla equipped.

SCINTILLA MAGNETO CO., INC.
SIDNEY, NEW YORK
Contractors to the U. S. Army and Navy
(Subsidiary of Bendix Aviation Corporation)



The MacClatchie "Panther" L-head radial aircraft engine.

DEPENDABILITY
SIMPLICITY
ACCESSIBILITY

(*Continued from preceding page*)

Navigation by Radiogoniometric Bearings

Radiogoniometry in the airplane and on the ground, methods of obtaining bearings—Quadrantal error—Causes—Determination and correction—Conversion angle—Position lines and fixes—Head and tail bearings—Method of working and laying off bearings, with particular reference to the charts normally used.

Meteorology

Pressure of the atmosphere—Barometer—Reduction of pressure to sea level—Winds—Wind measurement—Pressure gradients—Beaufort scale—Variation of wind with height—Diurnal variation—Temperature—Scales in use—Measurement of air temperature—Water in atmosphere—Relative humidity—Formation of mists and fog—Clouds—Rain—Hail and snow—Conditions affecting visibility—Reading of weather maps.

Practical tests

Actual compass swinging or the compensation of a compass by means of a deviascope—Making a flight under supervision by navigational methods and fixing position at various times by dead reckoning—The actual taking of bearings and determination of quadrantal error.

It may be argued that such a complete knowledge as is outlined in the syliabus above is unnecessary for the everyday purposes of flying. This may be true; it is a question for the authorities of each individual country to decide the needs peculiar to the territories under their administration. Withal, it cannot be denied, I believe, that it is essential to have a greater knowledge of navigation than is required of a transport pilot today. When space is devoted in ground school courses to the study of the properties of duralumin and to its ultimate tensile strength in pounds per square inch, at least a larger proportion of time should be given to navigation than is generally the case at present. The excellent system of weather forecasting which exists throughout the United States merits a more intelligent interpretation than the average student is able to give through the knowledge acquired at ground school.

VALUE OF AIR RACES

(*Continued from page* 48)

attacked their problem from the ground up. The Fiat AS-2 motor was built for this specific purpose and the Macchi airplanes were built around the motor in a coordinated structure that fulfilled its purpose perfectly.

That year marked the beginning of the decline of the United States as a factor in speed competition and the ascent of the British and Italians.

In 1927 the Schneider contest was held at Venice, Italy, on September 26. The United States had no entry available in time and the Italians made the same mistake that we had previously made in attempting to "get by" with their 1926 planes, now known as M-52's, with increased power in their engines and slight detail refinements. On the other hand, the British appeared with a team of beautifully wrought seaplanes that were newly designed from propeller to rudder for this specific contest. The Supermarine Aviation Works had built a monoplane, the Supermarine Napier S-5, around the Napier Lion engine, in many respects similar to the one which had crashed at Baltimore in 1925, but they had gone to great lengths in the matter of refinement of detail. The Gloster people presented Gloster IV biplanes, also built around the Napier Lion engine and, if anything, more refined in detail than their teammates. The result of the race was never in doubt, the British Supermarine winning at a speed of 281.5

(*Continued on following page*)

The MARSHALL PROPELLER



With or Without Spinners

Spinners are the new detachable aluminum Back Plate and Cone Assembly—cut to Fit Smoothly—Replaces obsolete built-in type wood spinner—approved by Department of Commerce.

Engine	Without Spinner	With Spinner
Aeronca 30 and 36 H.P.	25.00	....
Szekely 30 and 45 H.P.	35.00	40.00
LeBlond 5 or 7 cylinder	44.00	48.00
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Curtiss OX-5—OXX-6	44.00	48.00
Kinner K-5	44.00	48.00
Axelson 7 cylinder	44.00	48.00
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Hisso A, E or I	80.00	....
Kinner C-5	80.00	....
Lycoming	80.00	....
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Above are listed the more popular makes. MARSHALL PROPELLERS are furnished for all makes of engines at proportionate prices, according to horsepower.

Marshall Propellers are manufactured from a combination of birch and walnut woods insuring additional strength and durability. Protective copper tipped shields are larger. Finished natural; higher in efficiency and guaranteed to give complete satisfaction as to workmanship, performance and durability.

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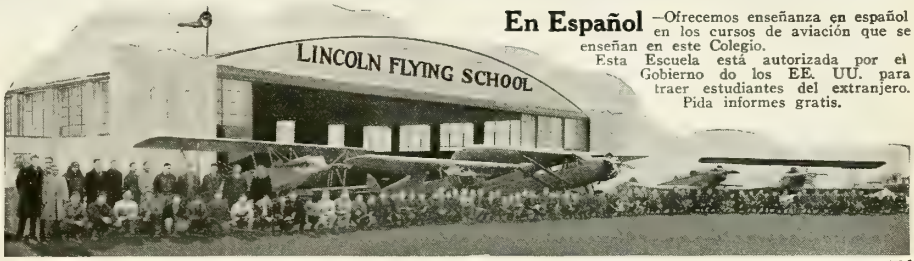
MARSHALL, MISSOURI

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"I Earn $400 per Month"

. . . Writes

C. L. Currier,
a Lincoln Graduate



En Español —Ofrecemos enseñanza en español en los cursos de aviación que se enseñan en este Colegio.
Esta Escuela está autorizada por el Gobierno do los EE. UU. para traer estudiantes del extranjero.
Pida informes gratis.



Here's His Letter—"I have had no difficulty finding steady employment as a pilot since completing training at your school in June, 1926; and I haven't missed a day of steady employment since. My first job paid $300 a month. During the past year I have been receiving $400 a month. The most essential requirement in aviation is to **take dependable, high class training such as you offer** at your school."

The School That Assures Success—Mr. Currier is only one of many successful Lincoln graduates. They're making good, these Lincoln men—**because they have had the kind of training that assures success.** The school with a world-wide reputation for turning out men who are really prepared.

Lincoln Graduates Are Preferred over graduates of any other school. That's because the aviation industry knows that Lincoln graduates have had superior training—that they are qualified to fill the positions—that Lincoln graduates have first place among the world's most renowned air men.

World's Best Known School—Lincoln is the world's best known Aviation school. The school after which newer schools try to pattern—but have never been able to equal. Men have come from all over the world to learn Aviation at Lincoln, where Lindbergh learned.

Lincoln Flying Training is complete and thorough. Instructors government-licensed, seasoned by long experience. Instruction on biplanes, high and low wing monoplanes, open and cabin types. Also 400 hours transport pilots' ground and mechanics' course without extra charge.

Our Employment Department assists students in finding part time employment while in training, and graduates to locate permanent positions.

Large Mechanics' School with Aircraft Factory in Connection—Big opportunities for licensed airplane mechanics. We teach by factory standards how to rebuild and rig airplanes for flight, to rebuild wings, fuselages, aircraft motors; also aircraft welding and aerial radio.

Complete Facilities—$250,000 worth of buildings and equipment. $100,000 airport with all-weather runways — lighted for night flying. **Ground and Flying School Government Approved.** Operated under regular supervision of the U. S. Dept. of Commerce.

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CATALOG ON REQUEST

Contains complete information about the Lincoln School and your opportunities in Aviation. Also liberal part time employment offer to help pay cost of board and room of students who enroll now. Mail coupon today if you mean business. Be sure to state your age.



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I am interested in:

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EXECUTIVES of the United Aircraft & Transport Corp. planned Boeing School courses—to give you exactly the kind of training the industry will demand. These men are acknowledged leaders in airplane design and manufacture and in transport operations. From daily experience they know why some beginners fail and why others succeed.

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(*Continued from preceding page*)

miles per hour, and another Supermarine coming second in the race.

For the Schneider Races next held in England in 1929, all of the entrants built new planes. The French entries were not completed in time and never appeared for the contest. The American entry ran into technical difficulties and could not be completed in time.

The Italian entries were very interesting, one of them, the Savoia S-65, being of very unconventional design. In this airplane two Isotta engines were mounted end to end, with the pilot between them, in a nacelle mounted on two extremely long slim floats with propellers at each end of the nacelle, one as a tractor and the other as a pusher, the tail being attached by struts and outriggers. The Fiat company presented its C-29, an extremely small monoplane having a wing area of only about 77 square feet and built around a special Fiat motor said to develop approximately 1250 horsepower. The Macchi company presented its M-67's, which were monoplanes almost identical in design with the previous M-52's and M-39's, although now fitted with new Isotta engines said to develop over 1800 horsepower. The Italian team was considered a very serious threat, but because of various ailments of one kind or another both the Savoia and Fiat entries were eliminated before the race even started.

The British had completed two entirely new planes for this contest. The Supermarine people built another monoplane, the S-6, similar in many respects to their previous S-5, around an entirely new Rolls-Royce engine which had also been specially designed for the contest. The Gloster people also built a monoplane around a new edition of the Napier-Lion engine and called the "Gloster-Napier VI", but they encountered some very mystifying form of motor trouble which could not be eliminated in time to start the race.

When the race was finally flown the starters were the two Macchi M-67's and one of the old M-52's for Italy and the two Supermarine S-6's and one of the old S-5's for Great Britain. From the start the Italian pilots flying the M-67's had difficulty and both landed on their second laps, thus leaving a clear field for the two S-6's, the old M-52 not being nearly fast enough to be a serious contender. The race was won by an S-6 at the remarkable speed of 328.63 miles per hour. The same plane was later flown for a straightaway speed record, attaining a speed of 357.7 miles an hour.

From the foregoing it can readily be seen that the advance in scientific development that makes possible the extremes of speed which we have today is so rapid that to stay in the lead not a day can be wasted. We read much about the efficiency of our Army and Navy. It is all very true as applied to personnel, but the story as regards material is not such happy reading. The British are reliably reported to have service types of planes capable of considerably over 200 miles per hour. We have nothing of the sort. The improvement in performance of our airplanes was rapid until we ceased our serious racing efforts. Since then the increases in speed have been far from rapid. This is not due to any lack of effort on the part of the engineering and procurement officers of the Army and Navy, for they have done their utmost to increase performance. The difficulty lies in a lack of the funds necessary for experimental development which is really what the developing of a racing plane amounts to. No manufacturer can afford to do this "on his own" as he has no possible way of getting his money back. Sales com-

(*Continued on following page*)

This thoroughbred fighter has *proved* what BOEING STAMINA means!





Above—the Wasp-powered Boeing P-12C Army fighter.
Right—Air Corps photo showing Boeing P-12B fighters on flight that set a new international altitude record.

YOU can pull this plane out of a 10,000-foot vertical power dive at 350 miles an hour! In 6½ minutes it can take off with full military load, climb 10,000 feet and return to the ground!

Eighteen Boeing fighters of the 95th Army Pursuit Squadron climbed in unbroken formation to an altitude of 29,000 feet, an international record. Planes of this type have reached altitudes as high as 33,000 feet.

No ordinary plane could stand what is simple routine for Boeing fighters . . . dog fighting in rarified, freezing atmospheres . . . the shock of hundreds of landings on airplane carriers . . . spectacular high-speed maneuvers in wing-and-tail formation . . . 5-mile-a-minute dives with bombs.

There is no substitute for Boeing stamina—built into commercial as well as military planes.



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AIRPLANE COMPANY
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ELGIN announces two NEW Aviation Clocks



ELGIN Model WC—Eight-day clock with sweep second hand. Specially adjusted to heat and cold and three positions. Front wind and set. Shown here actual size.

NEW in convenience—new in appearance—but with the same unfailing accuracy of all ELGIN products—these new ELGIN Clocks offer features that you will value during every hour of flying. We urge you to write for detailed information.



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ELGIN

ELGIN NATIONAL AERONAUTICAL CHAMBER OF COMMERCE WATCH COMPANY

AIRCRAFT INSTRUMENT DIVISION, *Elgin, Illinois*

(*Continued from preceding page*)

petition is so keen in the aircraft industry that the cost cannot be made up by an increased selling price and the enhanced sales volume resulting from the racing publicity is not nearly enough to meet it. We have the necessary engineering talent available to build the fastest airplanes in the world. Designs are available which lack only the necessary development funds. The time available between now and this year's Schneider contest is probably entirely too short to hope to produce a serious contender, but the next contest will come along much too soon to permit any design started now to be obsolete then. We cannot hope to make up in a few months what our idleness of six years has cost us and if we really want to see our aircraft again leading the world, now is the time to get started.

PILOT AND THE COMPASS ERROR

(*Continued from page* 59)

deviation table given above was one actually obtained in a naval plane after the compass had been compensated. In the military services particular efforts are made to insure that the compass is placed in a location that is the best possible from a magnetic standpoint and at the same time a practical one from an operational standpoint. In commercial planes, unless similar pains are taken larger values for the deviation may be encountered. If deviations of greater than ten degrees are found on any heading or headings, and examination proves that the compass is not defective, the compass should be remounted in a more favorable location.

The process of swinging the plane for deviations usually follows one of compensation of the compass. If it is believed that the deviations on any heading are five degrees or less, then the deviations may be obtained without any necessity for compensation. But if the deviation on any heading is greater than this figure, then the compass should be compensated. The reason for not compensating when the deviations are small lies in the fact that compensation involves the placing of compensating magnets in close proximity to the compass. This results in a decrease in the sensitivity of the instrument. For the same reason, the compass is compensated, care should be taken not to overcorrect on any heading as the compass in this case would be over-compensated and apt to become very sluggish.

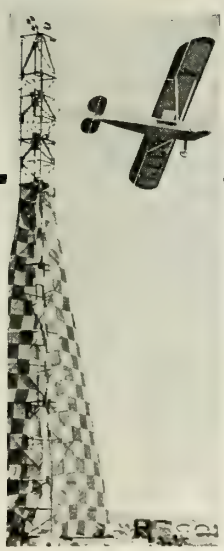
The actual process of compensation is accomplished as follows: The plane is aligned on magnetic north and care is taken to see that all moveable metallic parts such as tool kits, radio set, spare parts, etc., are stowed in their normal operating positions. If the compass is fitted with a built-in means of compensation, the correctors are placed in the zero position; if, as is most often the case, the compass is merely fitted with carriers for the compensating magnets, these carriers should be empty. The tail of the plane is elevated until the plane is in the attitude of normal horizontal flight. The engine is then started and as soon as it is running evenly, the heading of the plane by compass is noted. Then compensating magnets are introduced into the athwartships magnet carrier with the red end of the magnets to the right for easterly deviations and the blue end to the right for westerly deviations. The number and size of the magnets so introduced depend upon the amount of the deviation first noted. At any rate, as soon as the magnets introduced change the compass reading until it is the same as the magnetic direction, the correct combination of compensators has been discovered. With compasses having integral compensating units, these appliances are manipulated until a similar result has been obtained. The

(*Continued on following page*)

AIR "FLIVVERS"

at "flivver" prices!

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FIVE consecutive years Heath planes captured races for their class at National Air Races. Now you can have this splendid, sturdy ship with its dashing appearance and performance—at prices far below anything else available. Ready built or home construction kits. Used throughout U. S. and many foreign countries, by old experienced pilots and novices. Build it for $199, on installments.

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Fly with *Ruth Nichols*



From N. Y. Times April 14, '31

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ON record breaking flights, under the most severe flying conditions, world-famous fliers continue to depend on LUXOR GOGGLES for complete eye-safety and comfort.

LUXOR GOGGLES have a combination of safety and comfort features not obtainable in any other make.

Insist on LUXORS, there is a type for every flying need.

Luxor No. 5	$7.50
Regular No. 6	9.75
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With non-shatterable lenses	32.00

Prescription lenses can be furnished in all models.

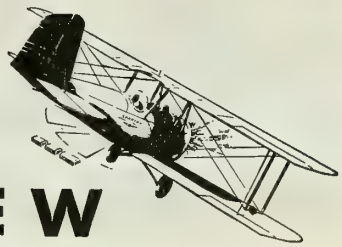
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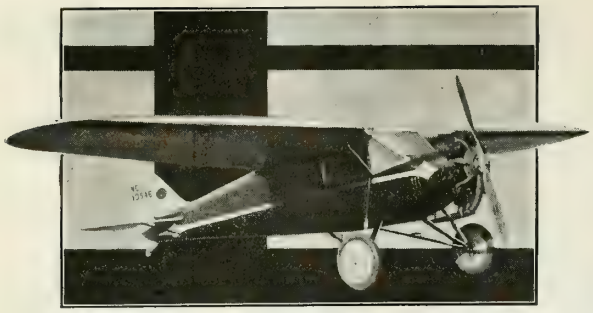
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SWEN SWANSON, designer, had this idea in mind when he first conceived the Swanson Coupe. The finished product is a reflection of his vision. We present this new plane with the warranty—"The finest automobile is no more luxurious than this sleek coupe of the air."

Draw this comparison between the Swanson Coupe and your own car. Side-by-side seating arrangement. Large, full length doors on both sides, with crank-up windows. Shatterproof glass. Roomy luggage compartment. Chase mohair upholstery. Oildraulic shock absorbers. Semi-balloon tires. Brakes. Complete instrument board. Smooth, rich exterior finish. Attractive, highly polished interior fittings.

The Swanson Coupe is fast—good for 125 miles an hour wide open; or 95 miles an hour cruising. It lands at 40 and climbs 1,000 feet a minute. A tank of gas will carry you 625 miles.

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(*Continued from preceding page*)

plane is then turned around and aligned on a magnetic direction of 180 degrees. It is again leveled and the engine started. If there is any deviation on this heading, the compensators are changed until this deviation is halved. The plane is then aligned on magnetic east, or ninety degrees, is leveled, and its engine started again. If any deviation is apparent then, compensators are introduced into the fore-and-aft magnet carrier with the red ends forward for easterly deviations and the blue ends forward for westerly deviations. The plane is then aligned on a magnetic heading of west or 270 degrees. Any deviation on this heading is halved by adjustment of the last mentioned group of compensators. The compensators are then secured and the compensation is finished. The deviation table is then made up by determining the deviations on the twelve headings as previously described.

Compensation of the compass has but one result; it eliminates or at least reduces the value of the deviations to reasonable limits. An aircraft compass cannot be compensated for variation. Even if it were possible to eliminate the effect of the variation by the use of compensators, the compass would be in error as soon as the plane was moved from the locality in which compensated to one where the value of the variation obtaining was different.

The process of compass compensation and swinging for deviations just described is used for the ordinary magnetic compass. Earth inductor and magneto compasses, while subject to the same errors require a different procedure, a description of which is furnished with this type of instrument by the manufacturer.

As far as the pilot is concerned, the selection of a compass or type of compass depends upon the employment of the plane in question. Roughly speaking, there are four general types of aircraft compasses. These are magnetic compasses, remote control magnetic compasses, sun compasses and gyroscopic compasses. In the first group we find the ordinary magnetic compass and the so-called aperiodic compass. The remote control magnetic type includes the earth inductor and the magneto compasses. Only one type of sun compass is made in this country. In the gyroscopic group, we find no practical example.

The ordinary magnetic compass is the cheapest compass for aircraft use and, together with the aperiodic compass, shares the distinction of being the type that is most dependable. The so-called aperiodic compass is one in which the arrangement of the internal magnetic elements is such that the period of oscillation of the compass card is greatly reduced. Slightly more accurate piloting is possible with the use of compasses of this type than can be expected with the ordinary magnetic compass. However, aperiodic compasses are fitted with cards that do not afford the pilot a direct numerical value of his heading. The necessity for a mental calculation to obtain this value detracts from the utility of this type, as it places an additional burden upon the attention of the pilot. One type of periodic compass has a direct reading card, but in this instance the card can be read only from above, thus precluding the possibility of mounting the compass at or near the eye level of the pilot.

The remote control compasses (earth inductor and magneto) depend upon the direction of magnetic flux from the earth's field for their directional impulses. An electrical means is introduced to transmit these indications to the vicinity of the pilot. Thus a better location from a magnetic standpoint is possible for compass itself. The values of the deviations are thus reduced and in addition the com-

(*Continued on following page*)



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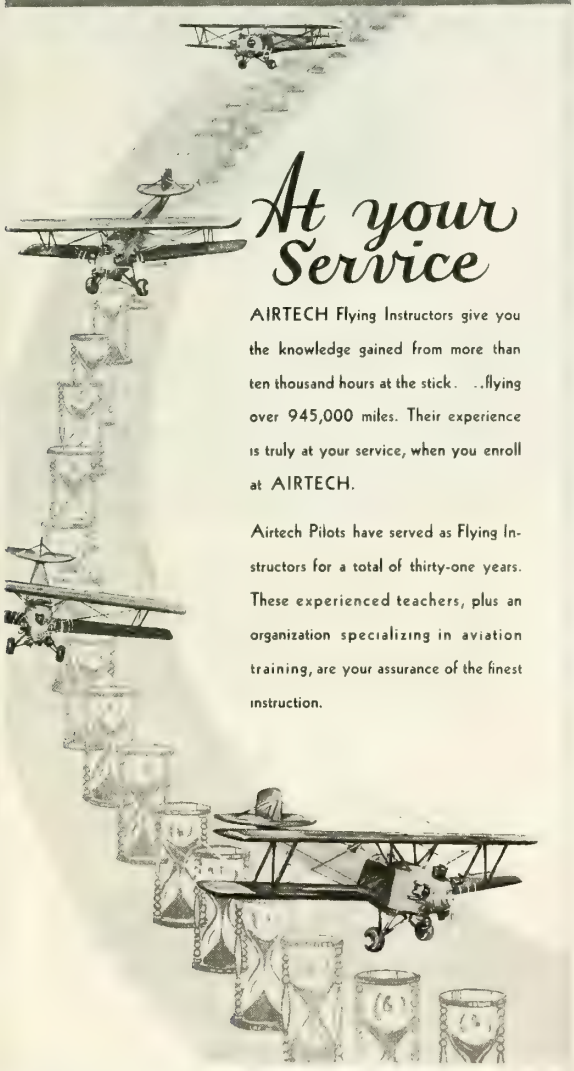
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(*Continued from preceding page*)

pass indications are less apt to be disturbed by vibration. Such compasses also are more sensitive than ordinary magnetic compasses. When properly adjusted and compensated, better piloting is possible with these compasses than is the case with other types. The objections to the use of remote control compasses are their high initial cost, the necessity for expert services for their maintenance and compensation, and their lesser reliability in operation.

The sun compass depends, for its directional indications, upon the changing azimuth or direction of the sun. Obviously, it can be used only during daylight and then only when the sky is not overcast. The use of this compass is therefore strictly limited and its utility is at a maximum in regions near the magnetic poles where the action of magnetic compasses is very erratic.

The single representative in the gyroscopic field is not, strictly speaking, a compass at all. It is not north-seeking and must be set by comparison with another compass. When properly set by comparison it gives, for a limited period of time, a very accurate conception of changes in the heading of the plane. When this period of time is exceeded, precession of the gyroscopic element destroys its utility and the instrument must be re-set by comparison. The chief interest attached to this device arises from the possibilities of its future development.

INSTRUMENT FLYING

(*Continued from page 39*)

ably have, pull back on the stick, which will start the pointer moving towards center, although it will not move quickly, as the rate of climb indicator is an altimeter and actuated by barometric pressure.

Now center the ball by means of aileron action, glancing back again at your turn indicator to assure yourself that the plane is still proceeding in a straight line and is not turning.

Of course, while this procedure has been described in a one-two-three-order, it should be understood that all three instruments have been centered, or should be centered, in a matter of seconds. For instance, considering the procedure again, it should be necessary to do no more than note with a quick glance that the turn indicator is to the right or left before instinctively pushing opposite rudder to straighten the plane out of its turn. The moment the mind has ordered the foot to perform the required rudder action, which will bring the turn indicator to center, the eye should instantly pick up the climb indicator, note whether the pointer is up or down and push forward or pull back on the stick as required. Then, even before the indicator has started to move towards center, the eye should note where the ball of the bank indicator is and move the ailerons to left or to right in order to bring the ball to center.

The point I am trying to make is that, although it is essential that all of these instruments be kept at a center in order to fly level and straight, the only way to do that is to consider each of the three instruments in rotation and train the entire processes of thought and required physical action to focus on each instrument in turn. Otherwise mental confusion of the pilot and flying confusion of the plane is almost certain to ensue. If, however, the pilot will train his eye and his mind to consult these instruments in turn and translate his information into the correct action, he will with practice find himself using this procedure subconsciously so that he will become unaware that he is

(*Continued on following page*)

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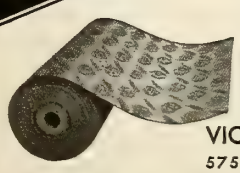
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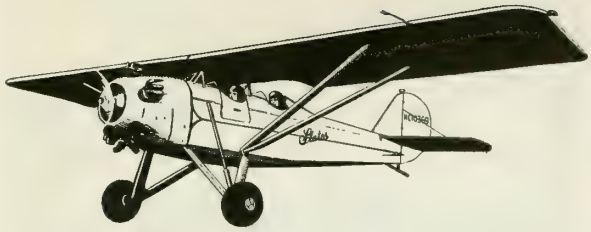
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(Continued from preceding page)

really consulting one before the other and will feel that he is regarding all of them as a unit.

However, in order to arrive at this eventual mental condition with its attendant correct physical reactions, it is necessary that the pilot discipline himself thoroughly to consider each of the three instruments as an entity in itself. He must train his eye and his mind to recognize instantly that the turn indicator is really a part of the rudder, that the climb indicator is what we might call the indicative part of the control stick, and the ball bank indicator a part of the wings. At any rate, in a condition of absolutely no visibility, these instruments are the only parts of the airplane whose relation to a straight and level path of flight the pilot can see. If he cannot see those in his mind, he is blind indeed, and the term "blind flying" is aptly used.

In turning, the position of these three instruments and their use must be reversed *in the pilot's mind.* That is to say, he must look first at the ball bank indicator, making sure that it is centered, so the plane is not skidding on the turn. Then he must look at the climb indicator to make sure that he is flying level, and last at the turn indicator to note the degree of turn.

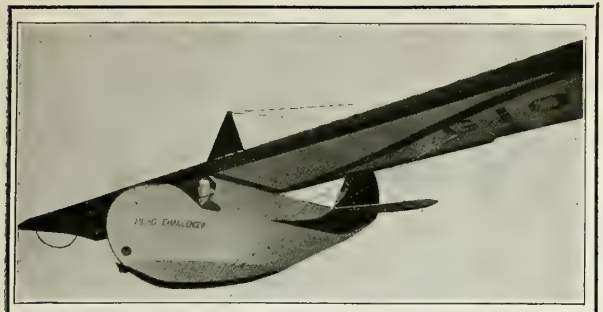
In coming out of the turn, the procedure is the same as that first described when coming out of the spin. He first centers the turn indicator and then makes sure that the climb indicator is still centered, and then levels the ship by the ailerons after consulting the ball bank indicator. With practice, of course, these three instruments will take shape as one in the pilot's mind and he will find himself instinctively consulting all three practically at the same time.

The tendency of the average pilot flying through a condition of no visibility seems to be to center most of his attention on the ball bank indicator instead of on the turn indicator, seeming to labor under the delusion that when the ball is centered, the plane is level in relation to the earth. This may not be the case at all, because when the plane is in a perfectly banked turn, the ball is in the center. And even in a vertical bank it is still in the center with the ship going around and around, possibly to end up in a power spin.

In a spiral, of course, the motor speeds up and the climb indicator denotes a downward movement. Then the natural and wrong thing to do is to pull back on the stick to pull the nose up. Instead of that, however, pulling back on the stick merely tightens the spiral. If the pilot corrects this with the turn indicator, a bad skid results, and the ball shoots to one corner. Then the natural tendency is to give up consulting the turn indicator and go back to the ball, trying to center it again. Instead of this, the pilot should forget the ball for the moment, and devote his attention to making the ship move first in a straight line, and then center the ball by means of the ailerons.

The minute a pilot in a power spin centers the turn indicator, the ball goes out. He should fix his mind on the turn indicator, believe what it says, even when the ball says the plane is skidding, and get the turn indicator centered *first.*

Of course, if the artificial horizon is used, blind flying becomes very simple indeed. With that instrument it is necessary only to keep the little airplane in the instrument level and to counteract any movements of the indicating airplane with counteracting stick or rudder action. When this single instrument is used, much of the confusion that troubles the pilot who is starting to do blind flying is avoided.



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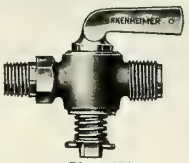


Fig. 1686
Male Pipe with Union End

25% LIGHTER

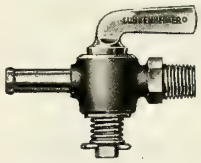


Fig. 1669
Male Pipe with Hose End

20% LIGHTER

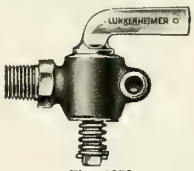


Fig. 1670
Male Pipe with
Elbow Hose End

23% LIGHTER

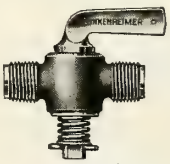


Fig. 1687
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(*Continued from page* 38)

tions and supporting papers are checked for completeness in accordance with the Air Commerce Regulations. At this time office records are made, and before the license certificate is mailed to the applicant, each file is given a final review, technical in nature, for the elimination of possible discrepancies. The license certificates are prepared on duplicating machines in order that sufficient copies may be provided for record purposes, such as cross reference, expiration file, and statistics.

Transport and limited commercial pilots' licenses remain in force for six months and industrial, glider, and private licenses, one year from date of issuance unless sooner revoked or suspended. The holder of such license may be required, at any time, to undergo a re-examination in any of the theoretical or practical tests prescribed as prerequisites for the original license.

Licenses may be renewed for like periods where the prescribed physical condition of the holder is shown by the same method as when the original license was issued, except that a transport or limited commercial pilot shall prove by a properly certified log book that he has had at least ten hours of solo flying within the last six months in each of the classes of aircraft for which he desires renewal. Industrial pilots shall have had at least twenty-five hours within the last year, glider pilots shall have made at least ten gliding flights or one soaring flight of at least one hour's duration, and private pilots at least ten hours within the last year, substantiated in the same manner as transport and limited commercial pilots.

If the applicant for renewal applies within six months after the expiration of his last license, a renewal license may be issued to him upon proof of his physical qualifications and the passing of the flight tests required for the class of license for which renewal is requested.

Mechanics

As defined in the Air Commerce Regulations, persons repairing or adjusting licensed aircraft in flight, and persons in charge of the ground inspection, overhauling or repairing of licensed aircraft, are classed as mechanics. A workman or mechanic may engage in the repair or overhaul of licensed aircraft without being licensed if such repair or overhaul is in charge of a licensed mechanic. An application for a mechanic's license must be filed under oath, with a Department of Commerce aeronautical inspector upon blanks furnished for that purpose. A person desiring to apply for a mechanic's license should communicate with the supervising aeronautical inspector for his district. (See map, fig. 1, and list of district addresses at the end of this article.) An applicant for mechanic's license is not required to take a physical examination. A citizen of any country may be licensed as a mechanic if found to be qualified. The minimum age requirement for any class of mechanic's license is eighteen years.

Mechanics are licensed as engine or airplane mechanics, and a person may hold a plurality of licenses, such as both classes of mechanic's licenses or a pilot's and mechanic's license.

An applicant for an engine mechanic's license shall have had at least two years' experience on internal-combustion engines, one year of which shall have been on maintenance of aircraft engines. All applicants shall be able to read, write, speak and understand the English language. The applicant may be licensed upon passing a theoretical and

(*Continued on following page*)

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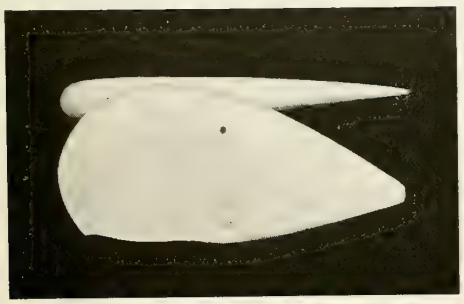
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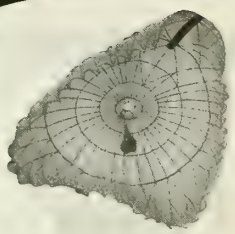


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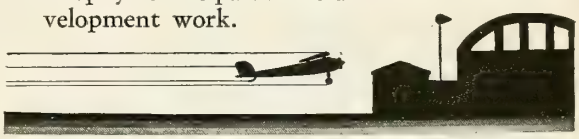


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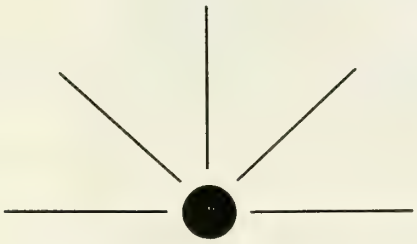
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practical examination on aircraft engines showing that he has sufficient knowledge of such engines and their accessories, including ignition systems, properly to inspect, maintain, repair, and overhaul them, and an examination on chapters 1, 2, 3, 4, and 6 of the Air Commerce Regulations and the regulations governing alterations and repair to licensed aircraft.

Subjects of Mechanics' Examinations

An applicant for an airplane mechanic's license shall have had at least one year's actual experience in building or maintaining or repairing aircraft. He may be licensed upon successfully accomplishing a theoretical and practical examination on aircraft structure and rigging, including control systems, on inspection, maintenance, repair and overhauling the same, and an examination on chapters 1, 2, 3, 4, and 6 of the Air Commerce Regulations (Aeronautics Bulletin 7) and on Aeronautics Bulletin No. 7-H, Air Commerce Regulations for Engines and Propellers.

The minimum passing grade in each subject covered shall be seventy per cent. Examinations for mechanics' licenses are conducted by aeronautical inspectors, and an applicant may arrange for his examination by writing to the supervising aeronautical inspector for his district.

Applicants for mechanics' licenses who have failed to accomplish successfully the prescribed theoretical or practical tests may apply for re-examination at any time after the expiration of ninety days from the date of such failure.

Mechanics' licenses, unless sooner suspended or revoked, will remain in force for two years after date of issue and will be renewed for additional two-year periods upon proof that during the term of the last license the holder has rendered services under his license during at least one-half of the term thereof. The license holder may be required at any time to undergo a re-examination in any of the theoretical or practical tests prescribed as requisites for the original license.

Parachute Riggers

The parachute supplement of the Air Commerce Regulations requires that parachutes shall be packed, or repacked, at least once in each sixty days prior to being worn during flights in aircraft, and that the packing or repacking shall be done by a parachute rigger who holds a Department of Commerce license, or who has been designated as a parachute rigger by the United States Army or Navy.

The parachute supplement defines a parachute rigger as "any person who packs, repairs, or is charged with the inspection and maintenance of parachutes used in accordance with the Air Commerce Regulations and Air Traffic Rules."

An applicant for this license follows approximately the procedure that has been outlined above for mechanics. He obtains his application blank from the supervising aeronautical inspector for his district or from an aeronautical inspector. (See map, and list of addresses of inspection districts at the end of this article.) He will be notified of the time of arrival of an inspector in his locality and will report to the inspector to submit his application and take the examination. If he passes the test his license then may be issued.

The applicant for a parachute rigger's license must be at least eighteen years of age. A citizen of any country may be licensed, provided he is able to read, write, speak, and understand the English language.

Examinations for the license are both theoretical and

(*Continued on following page*)



Wasp—Hornet—Wasp Junior

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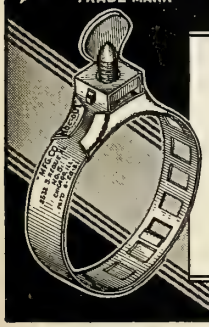
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(*Continued from preceding page*)

practical, and are designed to give the applicant an opportunity to prove that he is qualified by training and experience to care for and repair parachutes.

The minimum equipment that a parachute rigger must have available includes (1) ample housing facilities for the following equipment; (2) suitable table, at least 3 by 40 feet, with smooth surface; (3) rack where parachutes can be suspended for drying and airing; and (4) sufficient packing tools and repair equipment to repack adequately and make minor repairs to the type of parachute being repacked or repaired.

Parachute riggers are not permitted to make repairs where proper facilities are not available. In addition, they are charged with the responsibility of refusing to repack parachutes that are not airworthy, which means parachutes in need of such major repairs as replacement of canopies, panels, shroud lines, or harness.

The parachute rigger's license remains in force for two years, and then may be renewed if the rigger can furnish satisfactory proof that he has rendered service under his license during at least half of its term, and that he has packed at least twenty-five parachutes that have been used successfully in actual jumps or have been drop tested with dummies.

Addresses of District Offices

An applicant for a pilot's, mechanic's, or parachute rigger's license may determine from the map in Figure 1 the inspection district in which he resides. He then may obtain application blanks, and any other information that he requires, by writing to the supervising aeronautical inspector for his district. The addresses of the nine districts follow:

District No. 1.—Supervising aeronautical inspector, Department of Commerce, Roosevelt Field No. 1, Garden City, Long Island, N. Y.

District No. 2.—Supervising aeronautical inspector, Department of Commerce, Central Airport, Camden, N. J.

District No. 3.—Supervising aeronautical inspector, Department of Commerce, municipal airport, Atlanta, Ga.

District No. 4.—Supervising aeronautical inspector, Department of Commerce, Main Branch, P. O. Box 1691, Detroit, Mich.

District No. 5.—Supervising aeronautical inspector, Department of Commerce, municipal airport, 5300 West Sixty-third Street, Chicago, Ill.

District No. 6.—Supervising aeronautical inspector, Department of Commerce, 102 Richards Road, Kansas City airport, Kansas City, Mo.

District No. 7.—Supervising aeronautical inspector, Department of Commerce, Dallas Utilities Co. Building, Love Field, Dallas, Tex.

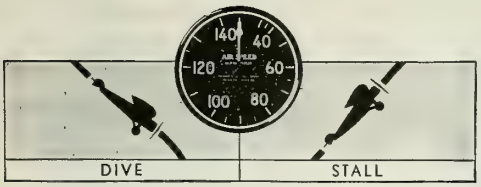
District No. 8.—Supervising aeronautical inspector, Department of Commerce, Oakland airport, Oakland, Calif.

District No. 9.—Supervising aeronautical inspector, Department of Commerce, 760 Bendix Building, Los Angeles, Calif.

The foregoing represents a description and discussion of the procedure to be followed in securing a license as a pilot or mechanic, and does not constitute the actual regulations applying thereto. Copies of the Air Commerce Regulations, published in Aeronautics Bulletin No. 7 and incorporating the regulations applying to licensing of pilots and mechanics, in addition to those applying to the licensing, inspection, operation, and marking of aircraft and the air traffic rules, may be obtained free of charge upon request to the Aeronautics Branch, Department of Commerce, Washington, D. C.

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of AERO DIGEST, published monthly at New York, N. Y., for April 1, 1931.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Frank A. Tichenor, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the AERO DIGEST, and that the followng is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The Aeronautical Digest Publishing Corp., 220 West 42nd St., New York, N. Y.; Editor, George F. McLaughlin, 220 West 42nd St., New York, N. Y.; Managing Editor, None; Business Manager, Frank A. Tichenor, 220 West 42nd St., New York, N. Y.

2. That the owners are: The Aeronautical Digest Publishing Corp., 220 West 42nd St., New York, N. Y.; Frank A. Tichenor, 220 West 42nd St., New York, N. Y.; Jessie H. Tichenor, 220 West 42nd St., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

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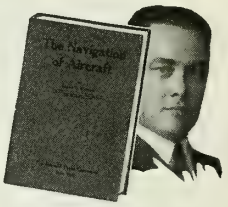
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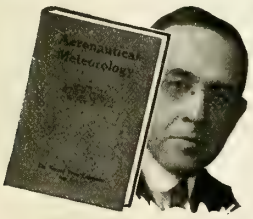
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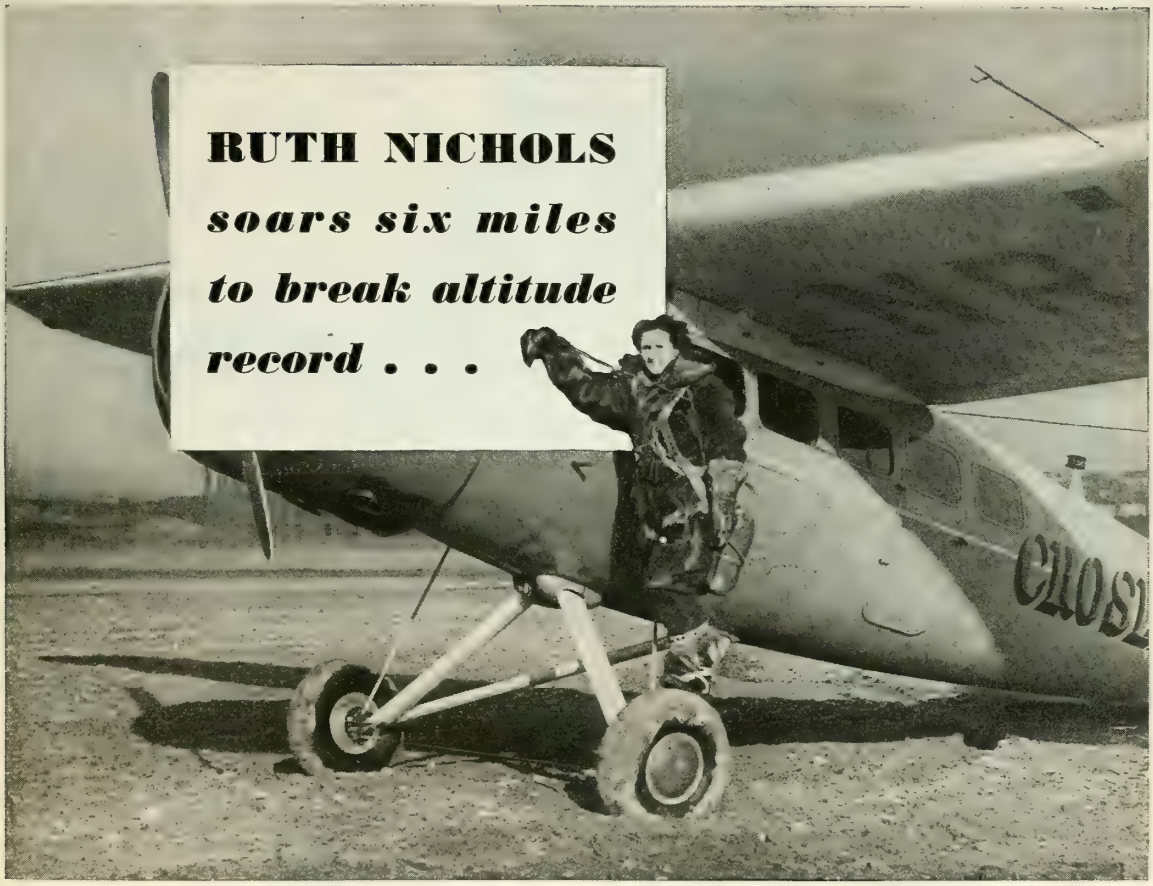
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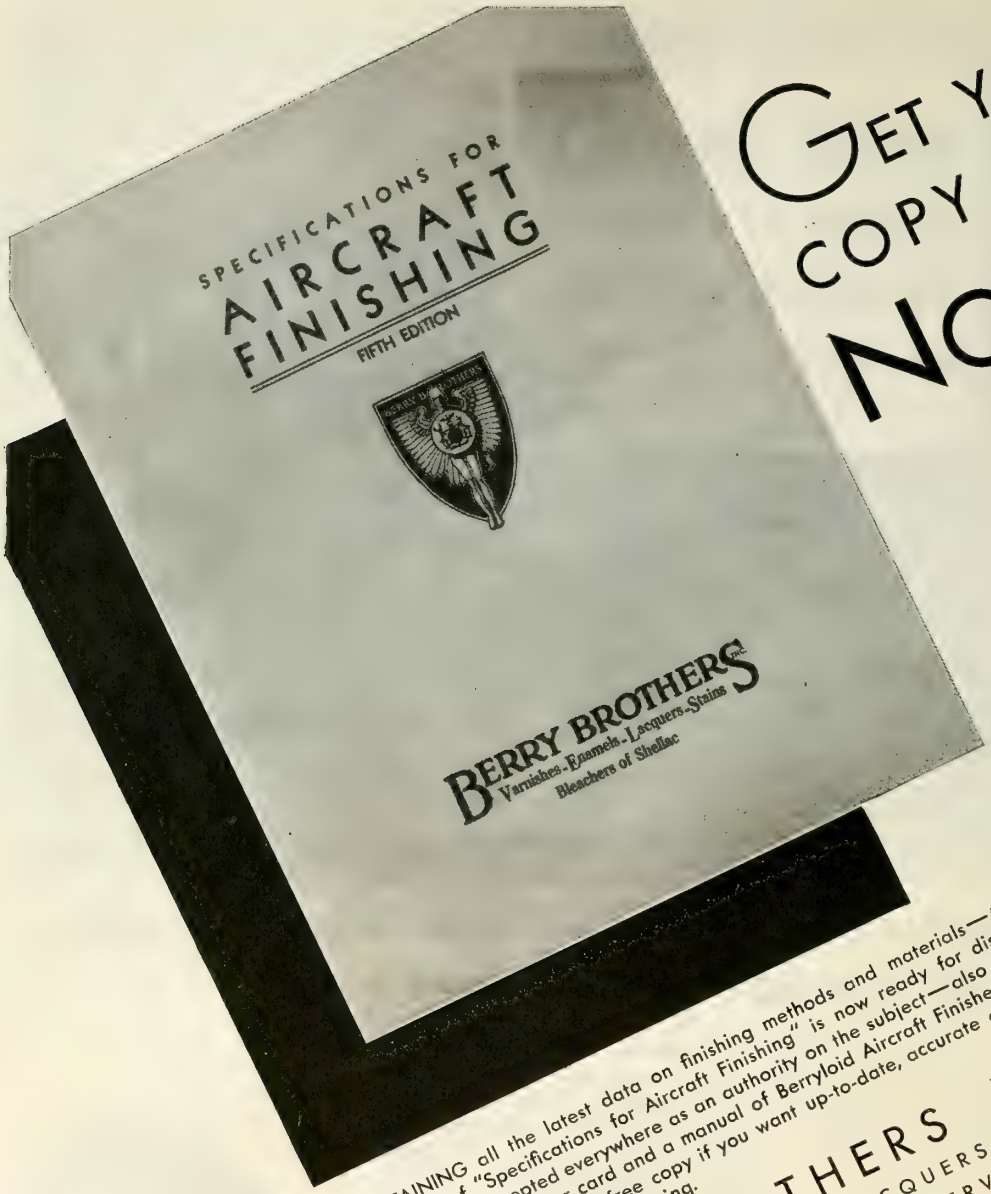
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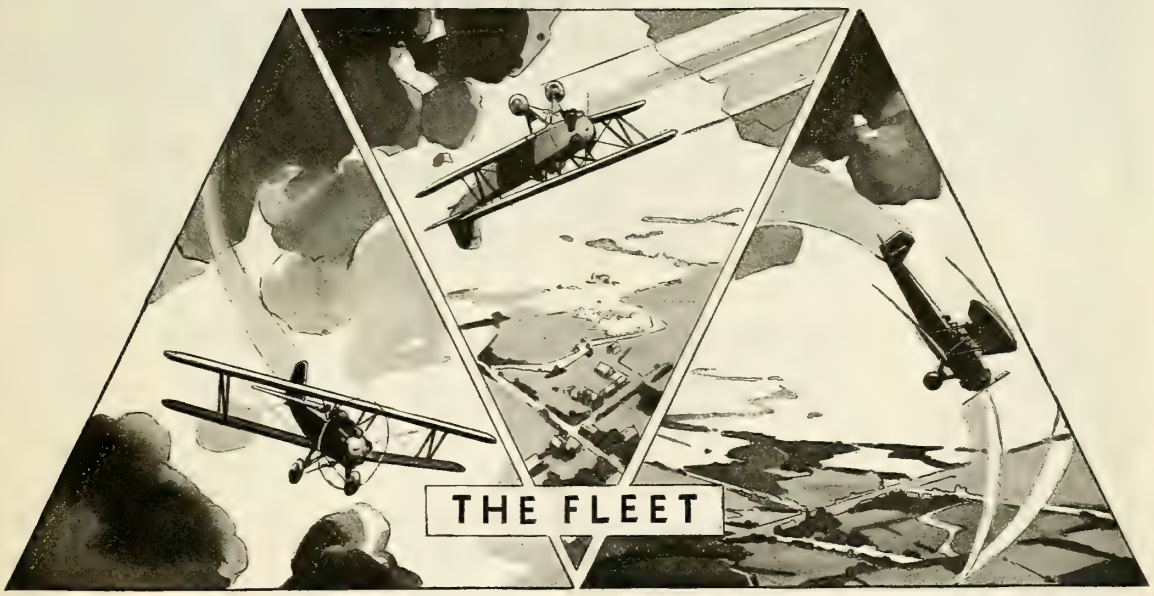
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Where PERFORMANCE TAKES PREFERENCE over PRICE



(Insert shows closeup of rotor spindle mechanism)

AUTOGIRO USES SKF FOR UTMOST DEPENDABILITY

THE AUTOGIRO ... another milestone in aviation . . . and again SKF Bearings keep step with the latest development. On the rotor spindle, in the starter mechanism and on the top location of the starter shaft ...12 SKF Ball Bearings are used for *known dependability.*

In the air, *Performance* is the only thing that counts . . . SKF Bearings PERFORM! On nearly every epoch-making flight of the past decade, SKF's have helped make history. In daily commercial and government service SKF reliability is an accepted fact. That's why SKF's are the *preferred bearings* with 65 leading manufacturers in the aviation industry...and pilots everywhere.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

2700

SKF



"will make thousands instead of tens, want to fly personally."



NEARLY 200,000 SPECTATORS WITNESS DEMONSTRATION OF DETROIT NEWS' AUTOGIRO, FEBRUARY 15, 1931

Characteristics

The Autogiro differs basically from all other heavier-than-air craft in the source of its lifting capacity. This lift is given primarily by four rotating blades which take the place of the familiar wings of an airplane. There is no time when this supporting rotation of the blades can be stopped while the machine is in the air, as their motion is produced solely by wind pressure caused by the movement of the Autogiro in any direction, climbing, level flight, gliding or descending vertically. The supporting rotation of the blades is entirely independent of the engine, whose sole function is to propel the Autogiro.

The Autogiro presents flying characteristics hitherto impossible. It can take off at low speed after a very short run, and immediately assume a steep-climbing angle. It can fly well over 100 miles per hour or as slowly as 25 miles per hour. It can be brought momentarily to a standstill and hover. It can bank and turn slowly without fear of loss of forward speed. It can glide or descend vertically at a speed less than that of a man descending in a parachute, and with virtually no forward speed even with a dead engine. Above all, it cannot fall off into a spin from a stall. As a result, little operating skill is required.

*"THE accomplishment that will put individual flying on the same basis of universality as the auto will be a flying machine that is as nearly fool-proof as the auto. The learner won't have to spend four or five hundred dollars learning to fly it, and he won't have to drive it through the air at better than express train speed in order to secure sustentation and control. He can climb it out of an airport half the size of a city block and land it in the same. And if the motor stalls, he won't have to say his prayers."**

*"A relatively small proportion of the present industry will suffice to supply all the needs of a normally expanding air transport activity and take care of military demands. The big business must come from the individual buyer."**

The Autogiro was conceived and developed especially to meet the requirements of the private owner market. A study of its characteristics reveals how completely its purpose has been accomplished.

The Autogiro Company of America is not a manufacturing or selling company. It is solely an engineering and licensing organization. It owns and controls, exclusively, all Autogiro patent rights in the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full cooperation of our engineering staff . . . Present licensees are: Buhl Aircraft Company, Detroit, Mich. . . . Kellett Aircraft Corp., Philadelphia, Pa. . . . Pitcairn Aircraft, Inc., Willow Grove, Pa. . . . We are now prepared to arrange demonstrations to acquaint the industry with Autogiro principle, design and operation, and to discuss production privileges.

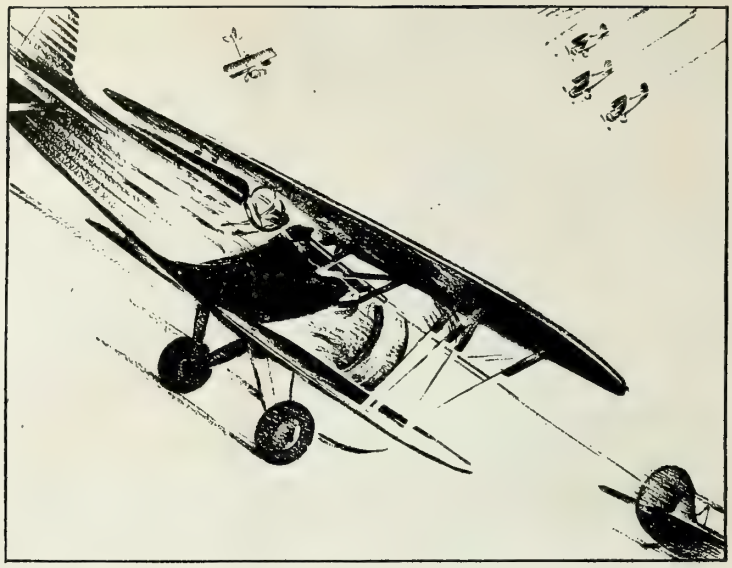
* *Italicized statements quoted from recognized authorities; names on request.*

AUTOGIRO COMPANY OF AMERICA · · · LAND TITLE BUILDING · · · PHILADELPHIA

AUTOGIRO

© 1931, Autogiro Co. of America

Here's the NEW NAME



COMBAT

Richfield's Aviation GASOLINE

RICHFIELD Aviation Gasoline now has a new name —COMBAT! The *"Fightin'est"* gasoline ever put in a motor!

It has new quality, too. Recent refinements in manufacturing plus carefully selected crudes—have produced a gasoline that surpasses "fighting grade" specifications as well as the most rigid requirements of commercial flying.

Here are some of the features:

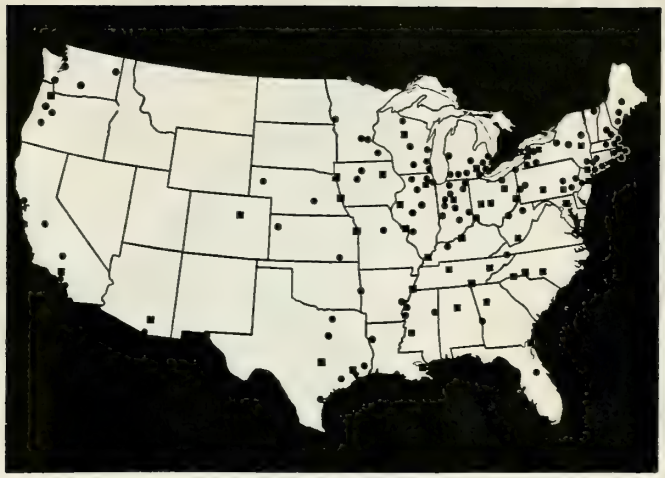
High octane number, high knock rating, low vapor pressure, unvarying uniformity, freedom from sulphur, corrosive matter and gum—

You get all these qualities in this super-aviation gasoline that sells at the same price as ordinary gasoline. COMBAT Richfield Aviation Gasoline is available at leading airports both east and west of the Mississippi.

Combat Richfield Aviation Oil, Combat Richfield Rocker Arm Grease, Combat Richfield Push Rod Grease—are other Richfield Aviation Products carrying the COMBAT name . . . and built to a higher standard of quality. Always ask for them.

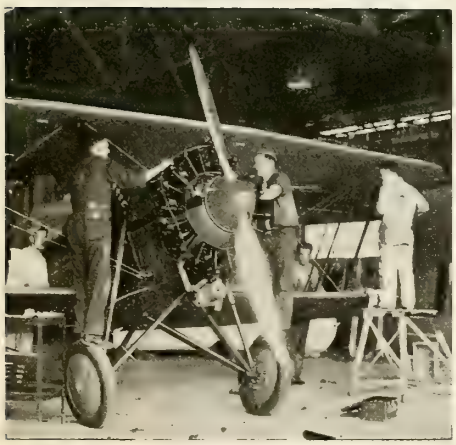
RICHFIELD OIL COMPANY

LOS ANGELES • • NEW YORK CITY





Service — one of the "invisibles" that makes WACO Value



• • •

The complete WACO line ranges from $4,450 to $8,525, with Heywood starters standard equipment on all models. Deferred payments can be arranged. And purchase of a new WACO includes any needed instruction. See your distributor for details.

• • •

In This Case . . . 70 *MINUTES!

Wire from a Vermont representative for wing and 5 other items, received .....*10:20 A. M.*
Wing boxed, other parts packed, and Express Company receipt signed at .....*11:21 A. M.*
Entire shipment left Troy on train .....*11:30 A. M.*
A typical example of WACO Service!
Exceptional? Well, perhaps...but certainly significant.

There comes a time in the career of every flyer . . . and in the course of every airplane's life . . . when that element called "Service" becomes the *one* important thing in the world to pilot and plane. ● Yet if that pilot happens to be one of the thousands who fly WACOs, service of any sort is within a short hop from wherever he is at the moment. It becomes an incident and not an exasperation. For, nearly 300 WACO representatives dot the map like buckshot blown from a blunderbuss. And 55 WACO distributors provide organized service facilities for all common replacement parts. ● In the less common contingencies, the factory can supply any part for *any* WACO ever built . . . and prides itself that this can be done within any 24 hours!* ● Ask any owner what WACO means by Service. It has much to do with WACO leadership in the number of registered aircraft . . . more than any other American make. It is the kind of service *you* can depend upon . . . and some day will want. It is not included in the specifications or in the purchase price . . . but *don't* overlook it in making your selection.

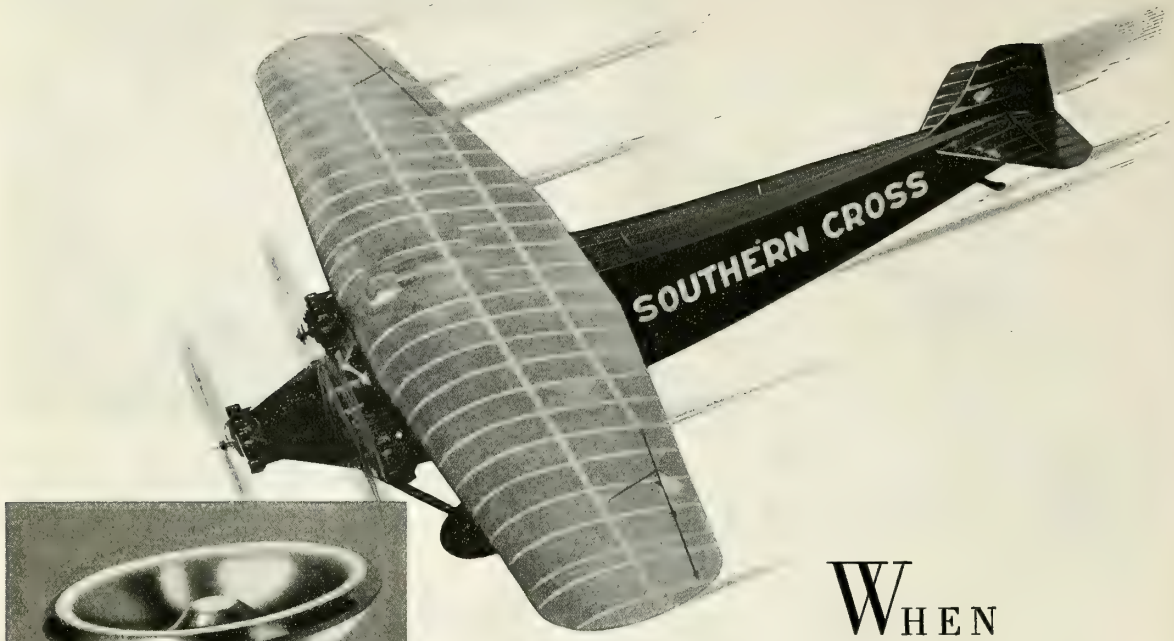
THE WACO AIRCRAFT COMPANY, TROY, OHIO

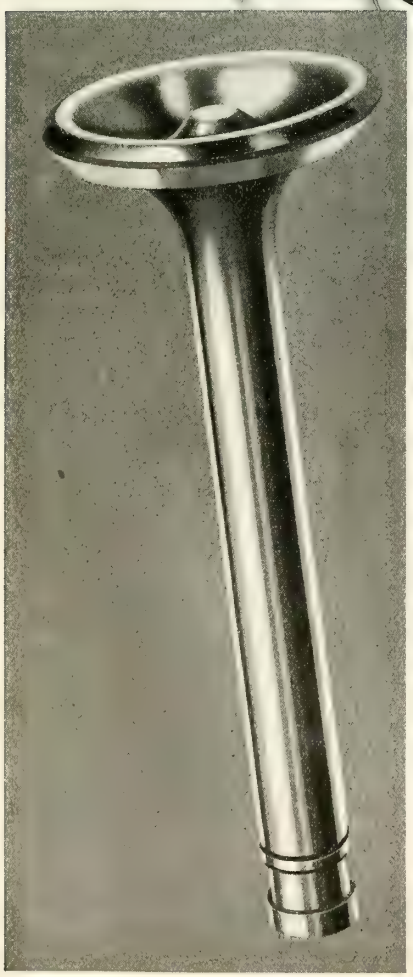
WACO AIRPLANES

"ASK ANY PILOT"

THERE ARE MORE WACOS IN PRIVATE AND COMMERCIAL USE THAN ANY OTHER AMERICAN MAKE

FAMOUS FLIGHTS WITH THOMPSON VALVES





WHEN *Kingsford · Smith*

MADE THE ATLANTIC A TWO-WAY THOROUGHFARE

Fighting a gallant battle against storm and fog, the veteran Fokker monoplane "Southern Cross," piloted by Wing Commander Charles Kingsford-Smith, landed safely at Harbor Grace, Newfoundland, on the dawn of June 25, 1930, completing the first successful east-west Atlantic crossing in a heavier-than-air craft. The start of this epic flight was Portmarnock, Ireland. The time, despite that lost through blind groping along the fog-bound coast, was 31 hours and 26 minutes.

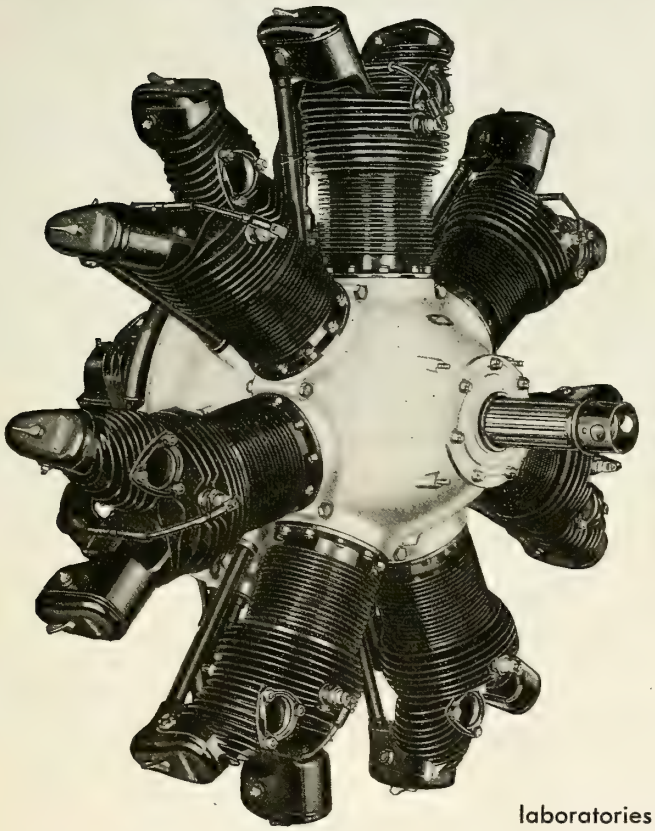
Throughout this time, the three Wright "Whirlwind" motors on which Kingsford-Smith and his three companions relied, never faltered in their duty. And as on previous occasions when this same ship and pilot made aircraft history — notably in the sensational 8700-mile flight from California to Australia in 1928 — the motors of the "Southern Cross" were again equipped with Thompson Valves.

THOMPSON PRODUCTS, INCORPORATED
General Offices: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT

This advertisement is one of a series recording famous flights in which Thompson Valves were used.

Thompson Valves

Undivided Responsibility



THE LIGHTEST 165 H.P. AIRCRAFT ENGINE ON THE MARKET
7-cylinder radial. 165 h.p. at 2000 r.p.m.
Navy test rating 177 h.p.

The Continental A-70 second series 165 h.p. aircraft engine is thoroughbred. From design to finished product this engine carries the responsibility and reputation of Continental.

All raw materials are subjected to complete chemical analysis and physical test at the Continental laboratories before the first machining process is started. Every machine process—every test—is conducted by Continental at the Continental plant—and must meet Continental's rigid specifications for acceptance.

This means that the Continental guarantee is based on *a Continental-built engine* —and that their responsibility to you is UNDIVIDED.

CONTINENTAL AIRCRAFT ENGINE COMPANY
General Office and Factory, Detroit, Michigan

Continental Engines

for the airways of America

Mammoth Production Insures

Schools make more money with AMERICAN EAGLETS, because

IT is the lowest priced licensed training plane. Lowest to purchase and lowest to operate. Dual instruction makes you a nice profit at $10.00 to $12.50 and solo at $8.00 to $10.00 per hour. It is the safest plane on earth for beginners — four seconds for each turn of a spin and you can't hold it in a spin. Perfect stability. $1.00 per hour for gas and oil. Admired by pilots. Loved by students. Schools everywhere are using American Eaglets.

Mr. Distributor, here's your opportunity to make money:

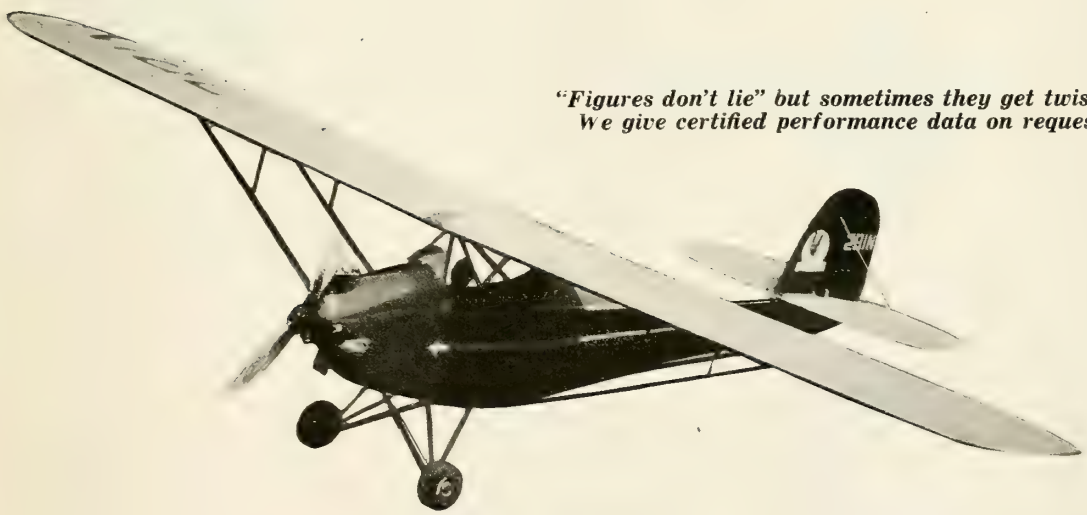
YOU can sell them to schools in every county because they have the lowest purchase and operating cost — because they are money makers — not a cheap plane, but the lowest priced two-seater dual control licensed plane. Low price justified by mass production. American Eaglet distributors lead in their territories. It is the sensation of air shows and meets. We can offer you an attractive money making proposition. Factory merchandising experts co-operate with you.

AMERICAN EAGLE-LINCOLN AIRCRAFT

Immediate Delivery . . . . .

Mr. Sportsman:

YOU will like it because it lands like a kitten's paw, is as fast as planes that sell at three times its price. It has wonderful flight characteristics. Sturdy construction methods. It is beautiful in appearance and is America's easiest-to-fly, SAFEST, plane. You will like it. May we demonstrate?



"Figures don't lie" but sometimes they get twisted. We give certified performance data on request.

Approved Type Certificate No. 380

CORPORATION, KANSAS CITY, KANSAS



AEROMARINE
LOW WING
MODEL 70

NEW LOW PRICES

Aeromarine Low Wing Monoplanes

LOW WING—LOW CENTER OF GRAVITY—LOW FIRST COST—LOW UPKEEP—LOW OPERATING COST

Model 70 Trainer $2500

A.T.C. 204 FORMER PRICE $3550

Model 85 Flyer $3300

A.T.C. 334 FORMER PRICE $3700

Discounts to Dealers and Field Operators

Equipped with Airwheels, Instruments, Navigation Lights—F.O.B. Factory, Keyport, N. J.

One operator's receipts for one season were over $13,000 for student instruction and "fly it yourself" service, using two Model "70's". Another field operator flew over 1,000 hours in a year with a Model "85".

The Low Wing Aeromarine has "flying appeal," which brings business your way.

SPECIFICATIONS

	"85"	"70"
Power—LeBlond	85 H.P.	70 H.P.
High Speed	100	93
Landing Speed	38	38
Cruising Speed	85	80
Climb at Sea Level	700	600
Cruising Range	5 hrs.	6 hrs.
Fuel Capacity	29	29
Oil Capacity	2 gal.	2 gal.
Weight Empty	1016	1025
Useful Load	574	565
Gross Weight	1590	1590
Wing Loading	8.2 lbs.	8.2 lbs.
Power Loading	18.7 lbs.	22.7 lbs.

SPECIAL PRICES ON DEMONSTRATORS

	Used	Price
Model 40	120 hours	$1250
Model 40	90 hours	$1500
Model 85	120 hours	$1900
Model 85	95 hours	$2000

Free Flying Instructions to All Purchasers at Established Flying Fields

W. L. DILL, RECEIVER FOR

AEROMARINE KLEMM CORPORATION

KEYPORT, N. J.

"How can I get into Aviation?"



Read this Answer from

A World Famous Trans-Atlantic Pilot

Aviation is waiting for no one! Too many millions of capital are already invested—the demand for air service of *every* kind is increasing too fast. Aviation demands men who KNOW. Men who can DO. Men who can step into the real jobs and command the real salaries. Landing fields, municipal airports, plane and equipment factories, air mail and passenger lines, service and sales organizations—all are leaping ahead in the fastest, most amazing development that any industry has ever known. In such racing, feverish activity, *where* is there any room for a man who has nothing to offer? An empty pocketbook is no drawback—but Aviation has no place, no patience, no *time* for empty hands or empty heads! Aviation is taking off for the greatest non-stop flight in history—and the men who will go along and climb to the top are the men with a foundation of FACTS under them.

You Don't Have to Fly; 40 Different Jobs On the Ground PAY Big Too!

To succeed in Aviation—make BIG MONEY—you need not necessarily be a pliot. There must be many thousands of pilots, certainly. But for every plane that flies, there's an immediate need for trained men in more than *forty* different important jobs on the ground. Construction, motor and instrument experts—airport managers, service foremen, salesmen—all make *real* money. Some of them at even bigger pay than pilots earn. But every last one of them must have the FACTS. Today's problem—YOUR problem—is to LEARN Aviation *quick*. And right there is where Walter Hinton is achieving the biggest success of his career.

Get Your Ground Work NOW Right at Home—Hinton Is Ready to Train You

YOU can train at home in spare-time for the best paid jobs in the Industry. Hinton's proved course starts you at the beginning, trains you fast. You get *all* the facts about construction, rigging, motors, repairs, instruments, theory of flight, navigation, commercial Aviation—facts that *every* man must have to intelligently and profitably fill *ANY* job in the Industry. With this Institute's training you'll have your foundation, your *start*, for real accomplishment. Serious-minded—*air-minded*—men are reading and *acting* on the Free Book shown below. We want YOU to have a copy too! Send the coupon NOW.

Aviation Institute of U. S. A., Inc.

Walter Hinton, President **1115 Connecticut Ave., Washington, D. C.**

WALTER HINTON

Walter Hinton was pilot of the famous NC-4, first plane to fly the Atlantic; he piloted the first plane from North to South America; he was first to fly to the headwaters of the Amazon. During the War he was a crack flying instructor for the Navy. Today—with a course that experts agree is the most complete and practical ever produced—Hinton is training keen-sighted men for the Big-Pay jobs in Aviation.

Get his FREE Book

You Must Be 18 or Over

To take an active part in Aviation you must be at least 18 years of age. If you are under 18, please do not ask for Lieut. Hinton's book, because it will not interest you.



Rush back to Washington *Quick!*

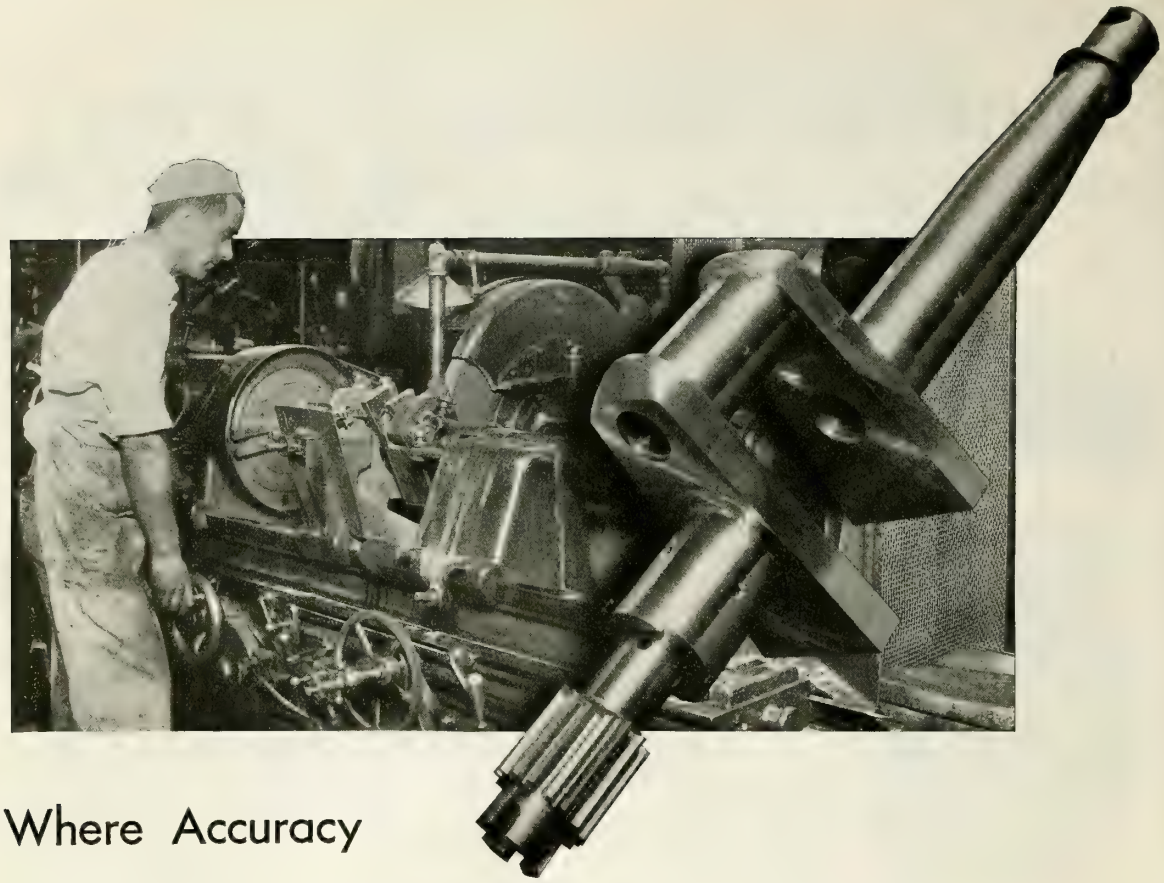
Walter Hinton, Pres. 702-A
Aviation Institute of U. S. A., Inc.
1115 Connecticut Ave., Washington, D. C.

Please send me at once your FREE Book "Wings of Opportunity," showing how I can get into this tremendous field.

Name .....
(Print clearly.)

Street ..... Age.....
(must be over 18)

City ..... State.....



Where Accuracy Is of Utmost Importance

Norton 23 x 36" Hi-Swing Grinding Machine in plant of Kinner Airplane and Motor Corp., Glendale, Cal.

The majority of the leading manufacturers of radial airplane motors have selected the Norton Hi-Swing Grinding Machine for finishing crankshafts—a vital part of their motors.

The machine is specially designed for this type of crankshaft and prospective manufacturers of airplane motors are invited to request full information and specifications.

NORTON COMPANY
WORCESTER, MASS.

NORTON

Grinding Wheels . . . . Abrasives for Polishing
. . . . Abrasive Aggregate . . . . Floor and Stair Tile . . . .
Grinding and Lapping Machines . . . . Refractories
. . . . Porous Plates . . . . Pulpstones . . . .

OVER THE MOUNTAIN TOPS—WITH THE ENGINE ACTUALLY GAINING "REVS"!



THE performance of the Packard-Diesel at high altitudes has amazed the aviation world! When flying over mountains pilots expect the engine R. P. M. to decrease—but they have found that this is not the case with the Packard-Diesel.

Recently, while climbing to cross the Rockies in a Packard-Diesel powered plane the pilot kept close watch of the tachometer. At 6,200 ft. the engine had gained 50 revolutions per minute—without the throttle being touched. At 10,000 ft., with the throttle still unchanged from a setting for a normal cruising speed of 1700 R. P. M., the tachometer reac 1800—a gain of 100 "revs"!

This is but typical of the altitude performance of the Packard-Diesel. Tests have further shown that the 225 H. P. Packard-Diesel is equivalent to a 350 H. P. gasoline engine at 20,000 ft. altitude. This is because the Packard-Diesel automatically adjusts itself to altitude with a resultant efficiency of operation which cannot be duplicated in any engine which requires manual adjustment for this ever-changing condition of flight.

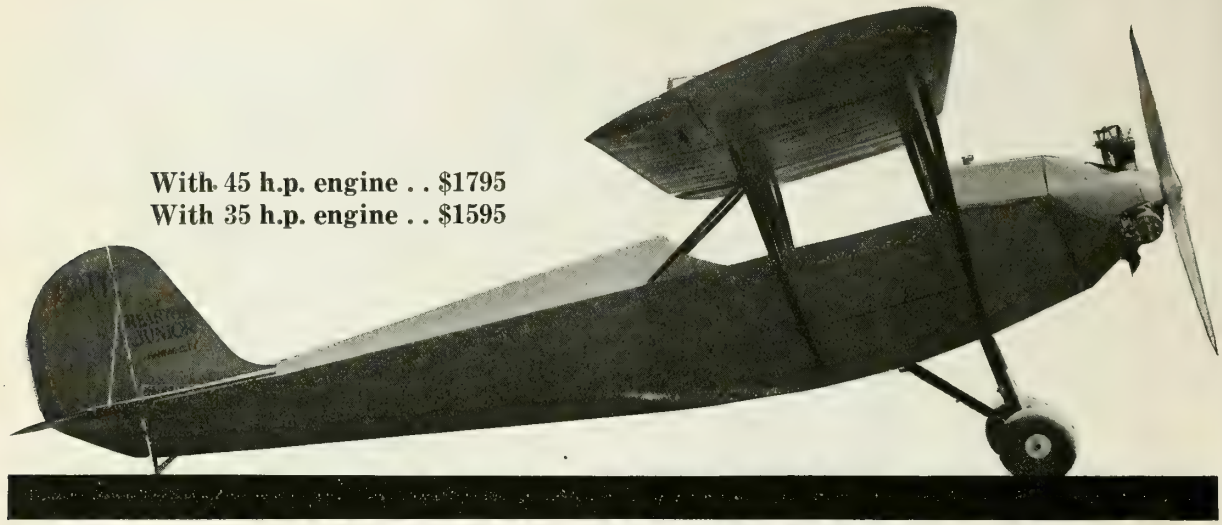
The relatively constant efficiency of the Packard-Diesel thus permits a much higher absolute ceiling and hence operations at high altitudes without a radical decrease in speed. These advantages plus many more inherent in the Packard-Diesel have been responsible for its world-wide acceptance. Today the Packard-Diesel is everywhere recognized and acclaimed!

PACKARD MOTOR CAR COMPANY
DETROIT, MICHIGAN

PACKARD-DIESEL

ASK THE MAN WHO OWNS ONE

REARWIN "JUNIOR" OWNERS ARE SATISFIED OWNERS



With 45 h.p. engine . . $1795
With 35 h.p. engine . . $1595

AFTER you have purchased a plane it is too late to look around and see if perhaps some other make wasn't a better buy. Look now, carefully. And look at the Rearwin "Junior," a normal powered airplane. See for yourself why every owner of this new and finer airplane is so satisfied with his choice.

Here is a product which represents true value—from basic design to the finished job. The Rearwin "Junior" is built around an unusually sturdy fuselage. Its landing gear, also, is the most rugged for an airplane of its size. An approved type 45 h.p. motor gives the "Junior" a source of reserve power which, as a rule, is obtainable only in larger craft.

A few of the features which recommend the Rearwin "Junior" to the prospective plane owner are: cutaway center section which provides perfect visibility, dual controls, full-size tandem cockpit, semi-airwheels, shock absorbers, perfect streamline, rich finish, cent-a-mile operating cost, 72-inch landing gear, luggage compartment, stabilizer adjustable from both seats, and performance far above anything in its class.

Make a note of these details and remember them when you compare the "Junior" with other low-priced airplanes. Wing spars of spruce, center section leading edge of formed spruce covered with birch plywood. Trailing edge of formed sheet duralumin. Wing tips of covered steel tubing. Wing fittings cadmium plated. Welded chrome molybdenum and carbon steel tubing. Wing span 36 feet, length 21 feet 8 inches, height 7 feet 6 inches. Weight empty 525 lbs., loaded 1,025 lbs. Wing loading 5.55 lbs. Power loading 22.5 lbs. And performance! Take-off in 7 seconds. Climb 700 feet per minute. Top speed 100 m.p.h. Cruising radius 400 miles.

We will be pleased to point out to interested dealers how the low price of the Rearwin "Junior" will increase their market materially.

REARWIN AIRPLANES, Inc.

FAIRFAX AIRPORT - KANSAS CITY - KANSAS

THE REARWIN "JUNIOR"



These are some of the TRANSPORT COMPANIES *now using* products marketed under this TRADE-MARK . . . . . .

●

Twenty-two months ago—at the National Air Races in Cleveland—Stanavo Aviation Engine Oil was first introduced. Today it is in use by more of the leading transport companies throughout the Western Hemisphere than any other airplane lubricant.

Nine months ago—after exhaustive tests—Stanavo Aviation Gasoline joined its sister product. Already it, too, has been adopted by many of the leading transport companies.

From the snow-covered plains of Canada to the sun-drenched jungles of Brazil, these products are recognized by all as dependable, uniform and of highest quality. They are available everywhere.

• • •

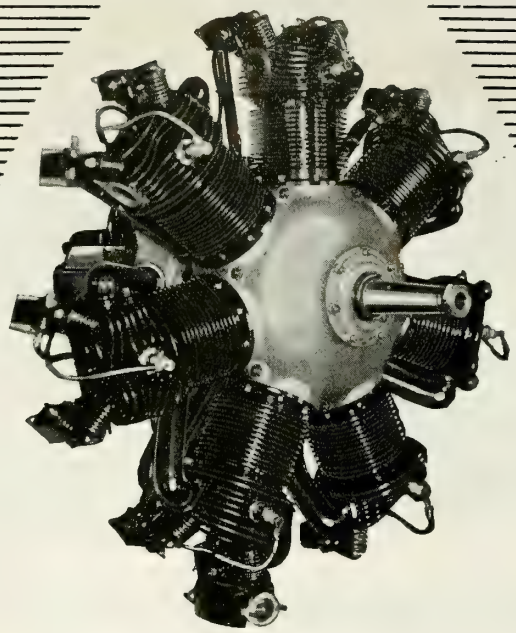
Such popularity constitutes definite proof of the quality of Stanavo products.



STANAVO
AVIATION ENGINE OIL AND GASOLINE

ONE BRAND—STANAVO—ONE QUALITY—THE HIGHEST THROUGHOUT THE WORLD

STANAVO SPECIFICATION BOARD, Inc.
Organized and maintained by
STANDARD OIL CO. OF CALIFORNIA
225 Bush Street, San Francisco
STANDARD OIL COMPANY (INDIANA)
910 S. Michigan Avenue, Chicago
STANDARD OIL CO. OF NEW JERSEY
26 Broadway, New York City



Keeping Step with Progress

The world moves—and so he who does not move with it must be left behind.

Nowhere is this progress more apparent than in the Aircraft Industry, where barriers of old and hoary precedents from the past, form no bar to the advance of the adventurous and the daring. There are no impediments to a free and open mind in this industry.

Thus Warner engineers and Warner designers are ever on the alert—ever keeping step with progress—to the end that the Warner Engine will embody always the latest improvements and advancements.

It is a never-ending task—but a stimulating one—this search for new ideas—new methods. It is this constant striving after the new and the better, that keeps the Warner Engine always as new as each new day.

WARNER AIRCRAFT CORPORATION
DETROIT, MICHIGAN

WARNER "Scarab" ENGINES

The BURNELLI TRANSPORT



THE Burnelli Transport combines the high efficiency of the single-engined airplane with the increased safety and capacity of the nacelle type multi-motored plane. It incorporates the following advantages:

Accessible multiple engine compartment, allowing inspection and minor repairs during flight.

Extensive reduction of head resistance, necessary to high performance.

Reduced turning moment on one engine, assisting flight with one motor operating.

Fuselage lift reduces landing speed, valuable for slow and safer landings.

Increased capacity of fuselage, maximum space for comfort and light cargo.

Practical landing gear retraction, greater future aerodynamic efficiency.

Superior safety in operation, through the location of the engines and propellers forward of the pilots and the passenger cabin.

Structural efficiency and simplicity. Constructed of extruded dural with flat sheet covering. Stresses of engines, propellers and landing gear bear no relation to wing truss.

Convertible to seaplane. The wide fuselage permits efficient twin float attachment, interchangeable with landing gear.

Designed to meet exact operating requirements.

ALL METAL



(Interior View of UB 20 Transport)

UPPERCU-BURNELLI CORP.

17 BATTERY PLACE, N. Y. C. KEYPORT, N. J.

Dallas Aviation School and AIR COLLEGE, Dallas, Texas



Major W. F. (Bill) Long (center) and 14 Transport Student Pilots enrolled here.

F. C. Rohrer, Wis., A. J. Vecillio, La., L. Tremblay, New York; B. Hook, Texas, F. Simmons, Chicago, D. Bosworth, Mass., T. Ellis, N. H., R. Marstrand, Canal Zone, J. Cockran, Ga., J. E. Borland, Penna., Dr. J. A. Bronson, Iowa, J. Craig, Pa., J. A. Gannon, Ill., George Young, Calif., all piling up the hours every day. Picture taken May 2, 1931. Largest class of Transport Students in the U. S. A. in any School.

Board and room at School $8 to $10 per week.

Dallas is a city of over 300,000 population.

You save time, money and living expense.

Best Aviation weather in the country.

You fly every day here.

Ask any pilot or airport Manager about us.

Our Prices—*Don't Pay more*

Transport Course—200 hours—Everything to qualify for transport license under approved school plan. Tri-motored Ford instruction included in course. Price for June and July ..... **$2,500.**

Commercial Course qualifies for limited commercial license. None better anywhere ..... **$795.**

Private Pilots Course—20 air hours qualifies for private license and complete in every way ..... **$385.**

Complete Ground School Course with all flying courses ..... **FREE**

Master Mechanics Course, 5 months complete training, including welding.

$250.

All kinds of Motors and Aircraft. This price advances July 1st to **$350.00**

Write or wire at our expense for our New June Catalog. Let us hear from you if you want to learn to fly!

We are approved by the Department of Commerce, U. S. Government, as a Transport ground and flying school.

We own our own hangars, dormitories, and cafe. Our investments are over $200,000, *everything new.*

We are located at Love Field—one of the finest Airports in the U. S. and are the only School at the field. This is the home of several large Transport concerns that have millions invested in ships and equipment.

No bond is required of our Students.

Everything to your advantage with us.

The flower of the nation is coming to Dallas to learn to fly.

You will be glad you came here.

10 years' Flying School Experience.

We pay your railroad fare to Dallas.

All our Ships have air-cooled motors.

Why pay more?

Dallas Aviation School

AND AIR COLLEGE

Love Field **Dallas, Texas**



Photo by R. I. Nesmith and Associates.

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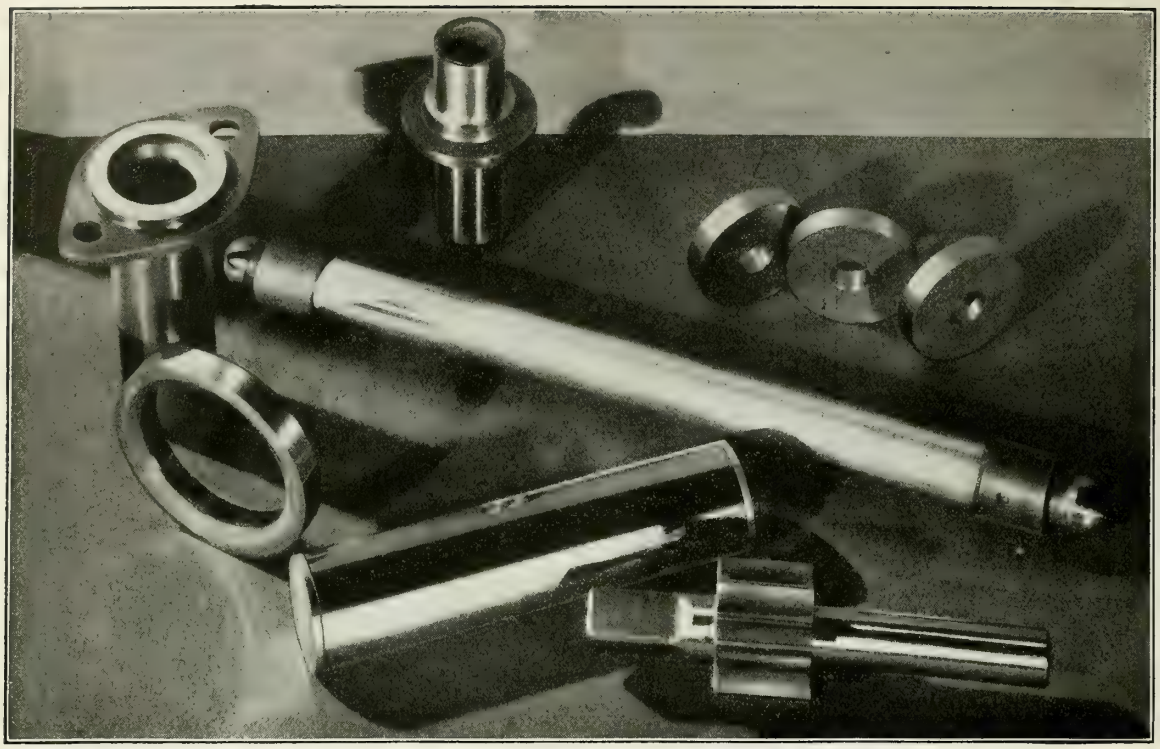
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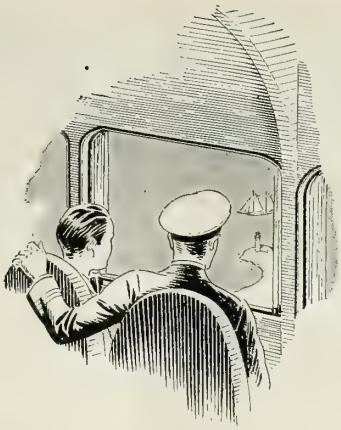
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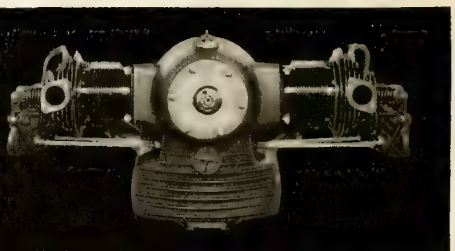
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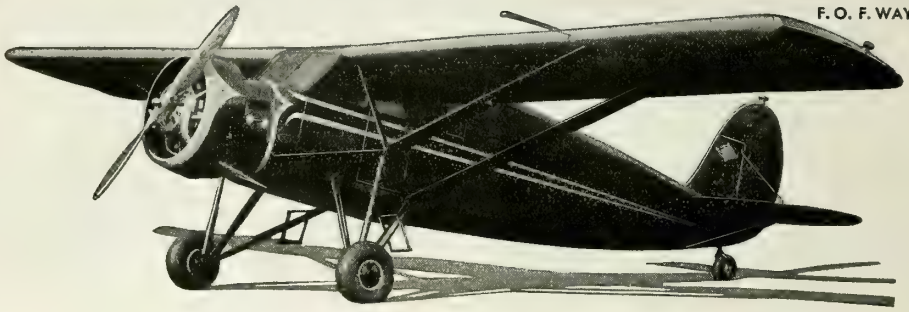
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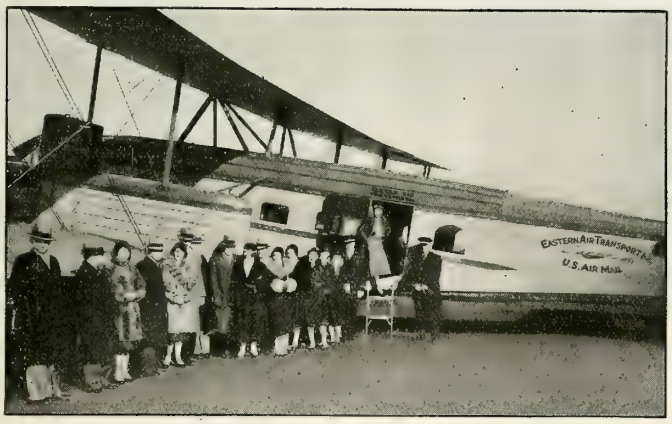
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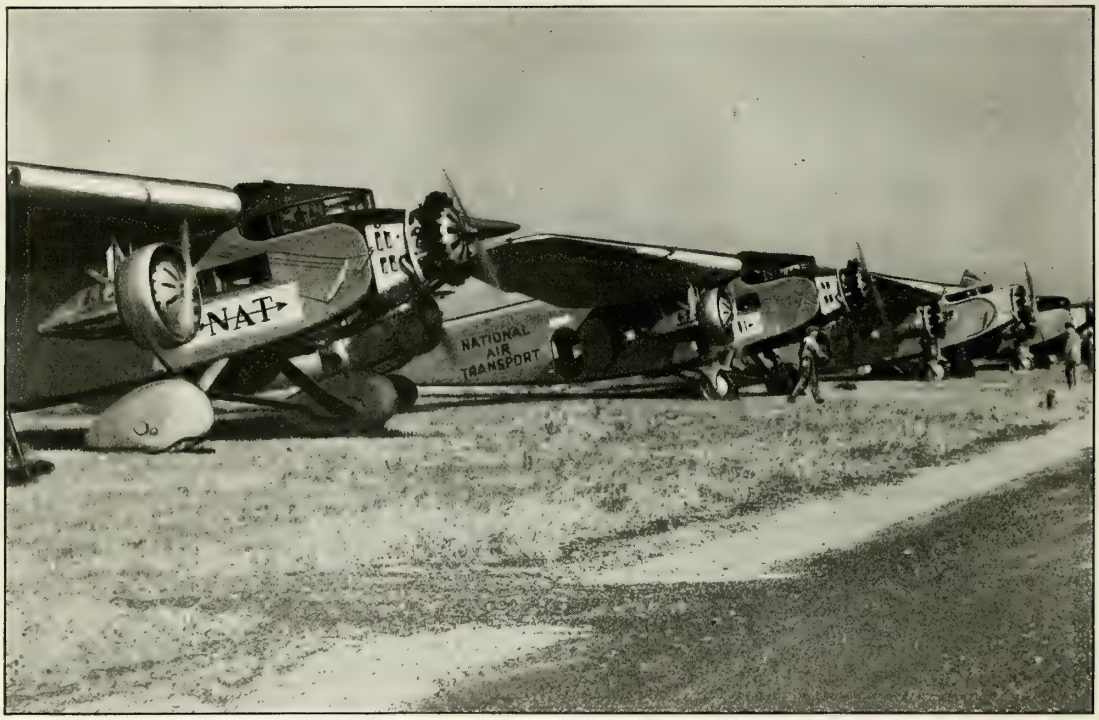
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U. S. Army Air Corps photo

DEMONSTRATING THE POSSIBILITIES OF NIGHT AERIAL PHOTOGRAPHY

As part of the annual maneuvers on the Atlantic Seaboard experiments in night photography were conducted by the Air Corps. This unusual view was taken from a military airplane 1,500 feet above New York Harbor on the night of May 23. A flashlight powder flare giving a 3,000,000,000-candlepower flash was dropped from the plane, revealing to the camera the Statue of Liberty and Fort Wood on Bedloe's Island. Successful experiments with night aerial photography have been conducted over a period of years by Lieut. George W. Goddard.

THE AIR CORPS WAR MANEUVERS

THE annual major tactical mission of the Army Air Corps was this year the most ambitious and comprehensive in the history of this branch of the United States air forces. It represented the greatest concentration of military aircraft and personnel ever organized in peace or wartime. The Air Corps maneuvers of 1931 were organized primarily to test and improve tactical theories regarding aerial defense of the Atlantic Coast against enemy invasion. It was assumed for the purpose of the exercises that a belligerent nation had launched an attack which threatened metropolitan centers on the Atlantic seaboard from New England as far south as Washington, D. C. Could the Air Corps summon from stations all over the country every available plane and man, mobilize an efficient air division and successfully speed to defense against the invasion? That was the problem to be solved.

Sponsors of the maneuvers believe that our Air Corps must keep pace with that of the other leading nations of the world, both in the number and quality of aircraft and the efficiency of personnel; that maneuvers on a large scale for practice in handling great numbers of aircraft and pilots are necessary to gain practical knowledge of how a wartime force should be operated. Therefore, in addition to being a practical test of the Army's theories of coast defense, the maneuvers were a test of the Air Corps' equipment, organization and methods, and, not the least important, the ability of the nation's commercial aviation industry to meet military demands imposed in time of emergency. Various incidental problems also resulted.



(*Air Corps photo*)

Brigadier General Benjamin D. Foulois, Hon. F. Trubee Davison, Major General James E. Fechet and Brigadier General H. C. Pratt, U. S. Army

These problems included the amount and distribution of spare parts and supplies; the usefulness of radio and other means of communication; the number of airplanes which can be operated successfully from individual airports; the length of time required to take off, land and service large groups of military aircraft; the ability of present size staff to handle details of organization; and the adequacy of tables of organization and equipment as well as supply and logistic schedules.

The maneuvers this year began with the movement by air of air units of the Regulars, Reserves and National Guard from Air Corps stations throughout the nation to Wright Field, Dayton, Ohio. Here they were mobilized into the First Air Division. This unit, when organization was completed, comprised 672 planes and 1,484 officers and men, an air force sufficient to destroy any major city in the country. A brief period of last-minute training and inspection was completed to weld the unit into an efficient organization. In preparation for the state of war over a 100,000-mile territory comprising approximately a dozen states, initial demonstrations were held at Dayton. These first exercises were in the nature of a dress rehearsal. Various difficulties arising from the fact that the groups of the Air Corps have but one opportunity annually to practise flying as an entire unit were, of course, encountered. The exercises on the first day were closely studied by the commanding officers of the various units with a view to whipping the division into as perfect and efficient a condition as possible. Then, profiting greatly from the lessons learned in the initial demonstration, additional dress rehearsals were carried out at Dayton.

The eleventh-hour training period allotted the Division in preparation for the defense of the coast permitted last-minute instruction in which was utilized the experience gained by the Air Corps on previous annual maneuvers and field exercises.

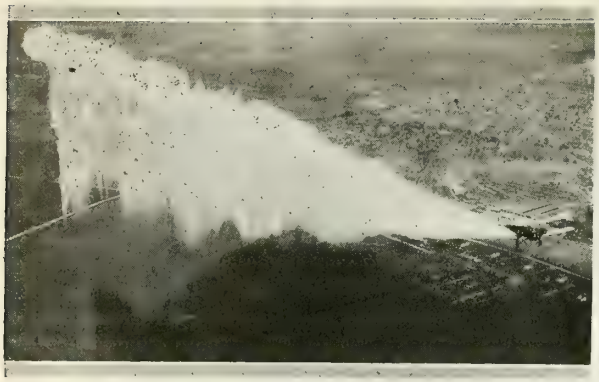
The second phase of the maneuvers consisted of the "attack" and "defense" by air of Chicago. The entire Division flew to that city on May 20. At dawn on May 21 the division was mobilized at five city and suburban airports, and during the day successfully carried out battle missions above the city. The force then returned to Dayton for the final and most difficult phase of the field exercises, the defense of the coast line against a "coalition of foreign powers."

Probably one of the greatest achievements in the maneuvers was the cross-country flight from the Middle West to New York City. The entire Division flew the various routes over the hazardous Allegheny Mountain range, refueling en route at military and civilian airports, and maintained formation all the way. At the destination, the units found adequate airport facilities for the planes of the entire Division. No air force of comparable size has ever been moved such a distance.

This flight from Dayton to New York City demonstrated one of the most important purposes of these maneuvers—to determine to what extent the air force may depend upon municipal and commercial airports in developing the efficiency of the Air Corps, especially as to mobility. In spite of fast and efficient planes, the effectiveness of the Air Corps would be greatly handicapped with inadequate landing and servicing facilities. For example, on the arrival in the New York area, participating planes required the maximum of facilities available at Roosevelt Field, Fairchild Airport and Curtiss-Wright Airport, commercial airports on Long Island.

It has been estimated that from the day they left their home stations until the hour of their return, the planes of the First Air Division have flown over every state in the Union, covering a distance of approximately 2,000,000 miles. The exercises alone entailed a plane mileage of more than 700,000 miles over airways that lead to Chicago, Dayton, New York, Boston, Hartford, Springfield, Albany, Trenton, Newark, Philadelphia, Baltimore and Washington, D. C. In covering this distance, many commercial airports of various sizes were used in addition to the military fields. Gas, oil and other supplies had to be laid down at these fields and adequate servicing facilities established.

The maneuvers not only demonstrated the value of com-



Army Air Corps photo

Bomber laying a smoke screen at Dayton, Ohio

mercial airports to wartime flying, but in a sense directly benefitted commercial airport operations. Although many of these fields are adequate for the number of planes normally using their facilities, the great influx of military ships created traffic conditions similar to operations five or ten years in the future. The operators have learned how they must prepare for the normal growth of commercial operations. Also, progress in ground management during the past few years was visibly demonstrated. It is pointed out that commercial aeronautics should be stimulated as a result of the maneuvers because the attention of so large a number of persons was attracted toward aviation. Approximately 75,000,000 persons had the opportunity of viewing all or some of the units of the Air Corps during the demonstrations over the various cities.

Exercises in New York and Vicinity

The greatest number of spectators at one time witnessed the maneuvers at New York City, on May 23, when planes and pilots of the First Air Division "defended" the city from "enemy" invasion. After coming in by the various routes from Dayton, the force was mobilized at the several airports in the vicinity of New York. After taking off, they concentrated in the area between Ossining and Peekskill, then swept down the Hudson River to the Battery in a double-deck column more than ten miles long. The combat demonstration ended with the laying of a smoke screen. The Division then joined into one solid formation about twenty miles long and passed in review over Floyd Bennett Field in a demonstration included in the dedicatory ceremonies of that airport.

After carrying out the phase of the exercises in the metropolitan area of New York, the Division moved on to New England and then south to the Chesapeake Bay area. The exercises were in operation for approximately two weeks.

Exemplary of the thoroughness with which the maneuvers were planned and executed were the elaborate safety precautions taken for the benefit of the general public and participating personnel. Planes were ordered not to fly over cities in weather which was in the least doubtful, even though it would permit flying under ordinary circumstances. Little danger from collision in the air was expected. With such a large number of planes in operation at one time it was believed that the law of averages might possibly result in one or two instances of engine failure. Should engine trouble have occurred over New York, pilots had strict orders to glide into the North or East River where they would be assisted by the harbor police. Special air traffic rules governing the operation of private and commercial aircraft were ordered by the Department of Commerce during the maneuvers. The temporary regulations provided that aircraft not engaged in scheduled operations were to remain at least one mile away from any formation of military craft engaged in maneuvers. Military pilots were ordered to use due precaution to avoid interfering with scheduled planes.

Number and Types of Aircraft Participating

The First Air Division consisted of a total of 672 planes as follows: 205 pursuit, 335 observation, 51 attack, 36 bombardment, 45 transport; and 797 officers, 69 flying cadets and 618 enlisted men. This number is equivalent to one-seventh of wartime strength, one-sixtieth of enlisted strength, and one-fourth of aircraft strength. While there was a deficiency in the number of bombardment units, there was a surplus of observation units. However, the Air Corps planned to make the best of existing conditions and utilize the actual peacetime strength of the organizations.

Types of planes and numbers of each participating in the maneuvers were: Pursuits—135 Boeing P-12; 75 Curtiss Hawks. Bombardment—10 Curtiss Condors; 34 Keystone Bombers. Light Bombardment—36 Douglass BT. Attack —70 Curtiss A-3. Observation—142 Douglas; 63 Curtiss Falcons; 60 Thomas-Morse. Transports—23 Fokker; 11 Ford; 5 Douglas; 4 Sikorsky; 2 Northrop. Photographic —2 Fairchild. Total, 672 planes.

Engines used to power these planes are: Pratt and Whitney Wasp, 289; Pratt and Whitney Hornet 119; Curtiss Conqueror and D-12, 214; Wright Whirlwind J-6, 45; Wright Cyclone, 16; Liberty, 81; Curtiss Hex, 1. Total, 765 engines.

For the first time in the maneuvers, the National Guard was permitted to take part, as were flying cadets selected from the graduating class of the Advanced Flying School, Kelly Field, Texas.

With the completion of the maneuvers, the results are being studied by officials, utilizing the experience gained in this large-scale operation with a view to realizing to the fullest possible extent the efficacy of the organization as an important weapon of national defense.



Army Air Corps photo

Line-up of more than 150 army airplanes at Wright Field

THE SNAILS OF BAGDAD

By Don Rose

ONCE upon a time, back in the days when ladies wore three petticoats and a nickle was a lot of money, a hare and a tortoise agreed to run a race, for no reason that is ever mentioned in the story. The hare took too many naps on the way and the tortoise just kept on rolling along and finished first, for all the good it did him. When interviewed by members of the press, he credited his success entirely to patience, persistence and a determined intention to get where he was going, even if he didn't know why. Slow and sure wins the race, provided the other fellow can be counted on to go to sleep on the job. That's what the tortoise taught us.

Nobody seems to have taken the trouble to check this moral by experiment or observation, or even by matching a hare and a tortoise in Madison Square Garden or Soldiers Field. But just when we were all beginning to doubt it, deep down in our sceptic hearts, it has been confirmed and established by a totally unexpected and incredible incident in the current news of aeronautics. The 1931 model of the old legend, indeed, makes Aesop seem like a piker. The Associated Press has demonstrated that it can tell a taller story with a straighter face, and provide a more profound and subtle moral than was ever done in fables or fairy tales.

The story is that a herd of snails or flock of snails or school of snails—or whatever it is that makes a lot of snails—has just put to ignominious flight a squadron of airplanes and a small but hard-boiled unit of the English Army. These snorting snails drove off the aerial enemy and are now in undisputed possession of the field. Nor will they be disturbed again. The Britisher is a stubborn and persistent bloke, but when he walks out on a fight you can't get him interested again. Otherwise there's no telling how you and I might be fixed today. We might still be paying taxes on tea, instead of on everything else.

It happened near Bagdad—on the Tigris, and not Bagdad, Fla. or Bagdad, Ky., both of which are probably swell places but not notable for snails. The British Royal Air Force had decided to put an aviation base there, the Englishmen having discovered that a few airplanes are a big help in administering a peaceful mandate and carrying the white man's burden without too many white man casualties. But unfortunately there were snails on the site they had selected.

They were sick snails. They had a bad case of bilharziasis. Bilharziasis is bad, and it has another name which is no better. Some prefer to call it schistosomiasis, but by any other name it would be just as dangerous and uncomfortable. The soldiers on the Western front suffered from it, and its most characteristic symptom was that the victim's internal arrangements began to go to pieces. And whatever it was that caused this unpleasant phenomenon, these snails had 'em.

So it was decided that it was much easier to move a few airplanes than to persuade a million snails to move house, and the airplane base was transferred to Basra. Figure out for yourself who won the argument.

Thinking it over, I favor the Britishers. I have been having trouble lately with snails myself. Some of it had to do with getting a book through the presses, which is a pilgrim's progress at a snail's pace. But I am thinking particularly of mis-spent time and wasted energies devoted to persuading certain parties that aviation has progressed beyond the point of novelty and experiment and has become a staple and stabilized industry. If you think that's all settled, you don't get around much. At a conservative estimate, the majority of full-grown Americans today are still sceptical of air transport and wary of anything that moves on wings. They admire aviators, but they won't ride with them except to show off to the neighbors. They cheer the mail pilots, but patronize the penny post. They are proud of the scheduled transport services, but they prefer to ride in Pullmans.

Most of them are snails, and some of them have bilharziasis. And it seems more certain than ever that those of us who assume to educate public opinion in favor of flying should move our base of operations to more promising territory. I am referring, of course and as usual, to the mob of young men and maidens which emerges annually from school at this season, certain of a lot of things which aren't so but not particularly prejudiced by the fears and habits of the older generation.

They will be getting a lot of advice at this time of year, but the fable of the snail and the airplane is particularly adapted to their benefit. They have been told too often for their own good that the way to get along in this world is to follow in father's footsteps, do nothing rash or radical, work hard and think along the lines that have been laid down for them. This is safe and conservative counsel, and it is in the nature of the older generation to play it safe. When a man gets past forty, indeed, he is likely to become suspicious of progressive independence and scared to death of anything that looks revolutionary. But it doesn't do for the youngsters to take him too seriously.

It will be admitted by many persons of prominence within the next few weeks that the world is in a mess—full of bilharziasis, schistosomiasis and a variety of other social, economic and political diseases. The youngsters will be cordially invited to clean it up. They will also be warned not to do anything drastic or unexpected while they are about it. Otherwise father and grandfather will throw fits.

The point of the parable is that it is sometimes a serious waste of time to attempt to patch up the trouble of a lot of sick snails. It is much better business to let the snails die in their tracks and start operations elsewhere. And for my annual word of advice to the graduating class, I would recommend that it should cultivate the courage of independence and the state of mind that says it is silly to spend time patching a poor piece of machinery. If you doubt it, I refer you to Henry Ford, whose success is undoubtedly due to the fact that he and I agree on many points of economic philosophy. Mr. Ford is proud of the fact that he can junk a factory full of obsolete methods and machinery in less time than it takes the average Amer-

(*Continued on page* 144)

FLYING ARTILLERY

By Lieut. L. B. Ely

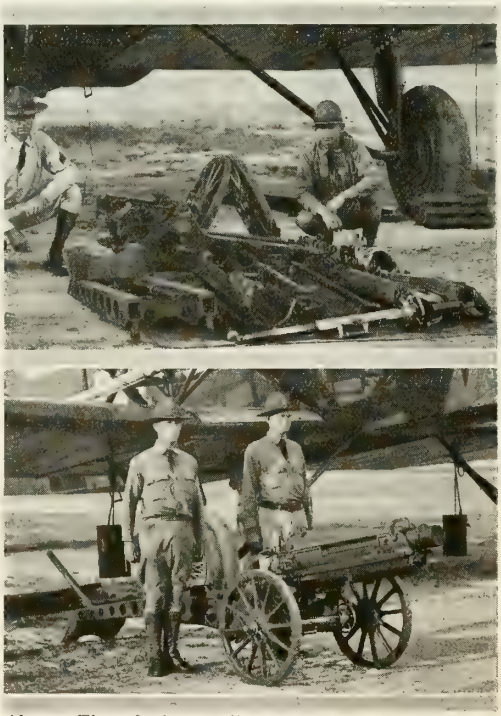
TEN years hence if field service regulations are revised one may read therein under the heading Field Artillery: "Its chief characteristics are fire power and power of movement in three dimensions."

If this comes to pass, the student of military science will be able to trace the three-dimensional characteristic of artillery back to an experiment recently completed in the Panama Canal Department.

Past experiments have proved the feasibility of moving small bodies of infantry and other ground troops by airplane. Even machine guns have been so carried and parachuted with their crews to the ground. But until February 1931, no military group had attempted the transporting of field artillery by air.

During January and February of 1931, the First Battalion, Second Field Artillery, stationed at Fort Davis, on the Atlantic end of the Canal, was participating in the annual maneuvers of the Panama Canal Department. This battalion, the only field artillery in the Canal Zone, had been recently converted from portee artillery to pack artillery and newly armed with the seventy-five millimeter pack 1923-model howitzer.

When the battalion took the field its new gun had been packed out in its six load section for only two months. A large percentage of the mules were still hardly beyond the remount stage and the new weapon had never been fired. Consequently, Major John B. Wogan, Battalion Commander, and his officers and men had plenty to think about and much to learn without delving into new ideas.



Above: Three-inch gun disassembled for loading into Keystone bomber. Below: reassembled after flight.

Nevertheless, when it became known that Battery B, commanded by Captain H. E. Tisdale, would have to return sometime during March to a newly acquired artillery range at Rio Hato, some eighty miles west of Panama City on the Pacific coast, some unidentified mule leader of the battery suggested the wierd idea of flying the battery back in army planes. The idea was passed around as a good joke until it fell upon the sensitive ear of Battery Commander Captain Tisdale. "Why not?" he mused. "There are plenty of airplanes at France Field, seven miles from Fort Davis on the Atlantic side. The bombing planes ought to be able to carry a gun apiece. It would save the railroad bills and would save time. Furthermore, it's a great idea."

So the Battery Commander talked it over with the Battalion Commander, who fell in with the plan enthusiastically. The possibilities opened up by the successful execution of such a novel experiment became apparent to them.

Panama is a long narrow strip of jungle and mountains. In its middle is Uncle Sam's priceless possession, the Panama Canal. A railroad parallel to the canal is the only other means of transisthmian communication; there is no road. Yet it is imperative that there be some speedy means of concentrating the military forces at any threatened point on either coast. From France Field any point on either coast where landing facilities exist can be reached by air in three hours or less. Obviously, air transport has great possibilities in the defense of the zone.

Accordingly it was decided to attempt the experiment. A tactical situation was invented for the flight of the battery to La Venta ranch, near Rio Hato, where the battery was scheduled to do some test firing. A Red force was assumed to have landed a hundred miles up the Pacific coast in a surprise invasion. Infantry from Fort Clayton had been rushed by trucks to Rio Hato and was holding with difficulty against the invaders. Other troops from the Atlantic side, including the artillery, were to follow by rail and motor transportation as soon as possible.

The situation at Rio Hato became critical. Retirement seemed imminent unless the Blue infantry could get immediate support from the artillery. Retirement meant surrender of favorable terrain and would give the enemy distinct advantages in his drive eastward toward the Canal. The Infantry Commander radioed the Department Commander informing him of his desperate need of artillery. The Department Commander had already alerted the Artillery Battalion Commander and the Air Corps Commander, and plans had been made to move a battery of artillery by air in case it became necessary. Transport planes and bombers were available.

By telephone the Battalion Commander received orders to move one battery, less animals, with reduced personnel to La Venta Ranch, there to report to the Infantry Commander. B Battery was selected to go and inside of a half-hour, four guns, equipment, fire control and signal equipment, two officers and forty enlisted men were on their way to France Field in Class B trucks.

One officer had already gone in a passenger car to France Field, where an observation plane was ready to take him to Rio Hato on reconnaissance. He was to consult with the Infantry Commander and was to radio back to France Field orders to start the flight.

Such was the tactical background for the experiment. The problems for solution before the beginning of the flight involved the method of loading, number and type of planes required, and the time necessary to make the move.

It was found that the howitzer could be loaded into the bomb-bay of a Keystone Bomber by disassembling it into its six main assemblies, passing it by hand into the plane and assembling it again inside the plane in a modification of its draft position. Eight minutes sufficed for the entire operation.

The only physical preparation necessary was a rack or frame of four-by-fours and two-by-fours to support the weight on the floor of the bomb-bay. Accessories and the equipment and rolls of the personnel were also loaded in and the gun lashed fast. Three men could be carried in each bomber with the gun, in addition to the pilot and mechanic. The Battery Commander selected the chief of section, his gunner and one cannoneer to go with each gun in the bombers.

Only three Keystone bombers were available, so a Ford transport plane was to be used for the fourth section gun. In this ship the gun could be disassembled and strapped to the floor midway back in the cabin, metal strapping bolts and two-inch lumber for the loads being prepared. One man besides the crew could travel in the Ford with the gun. The chief of section was selected as this passenger. Fire control equipment and a small amount of miscellaneous equipment were also to be loaded in this ship.

Two Sikorsky amphibions, each seating six passengers, were available. In their forward baggage compartment several barracks bags and miscellaneous equipment could be loaded.

Thus six planes were able to carry four guns and equipment essential for emergency use, and a personnel of two officers and twenty enlisted men. This personnel was thought, and later proved, to be adequate to unload equipment upon arrival at the scene of action, move the guns a short distance into position and serve the pieces for a short time.

A second flight of the six available planes would be necessary in order to carry the remaining personnel, their rolls and certain other equipment, to the scene of action. It was planned to unload the first flight quickly and let them return to pick up their loads for a second trip. Each Keystone Bomber was to take baggage, equipment and four passengers. The Ford plane was to take eight passengers and baggage and the Sikorsky planes were to duplicate their first trip loads.

In all, the second trip could bring to the scene of action thirty-two additional men of the battery making a total of three officers and fifty-two men with the battery in the field. This would be sufficient personnel to operate the battery for a considerable period of time if a means of ground transportation and supply were available. Actually, only forty men of the battery made the trip, the additional spaces in the planes being taken by officers and men going to Rio Hato in connection with test firing.

The day was March 20. At 6:30 a.m. the battery moved out in trucks for France Field. One-half hour was required for the trip to the field, but this was not counted as problem time inasmuch as under the tactical situation the battery was supposed to be at France Field in readiness to load when the radio message from the reconnaissance officers who flew to Rio Hato in an observation plane should be received at France Field. Upon arrival at the field, material was unloaded from trucks and spotted near the planes which were lined up in front of their hangars.

At 7:45 a.m. the radio message was received. The Battery Commander blew his whistle and the battery jumped into action. The little gun came apart and as if by magic disappeared into the bowels of the waiting ships. An increasing roar of warming motors blanketed all other noises. At the other end of the field twelve pursuit planes took off in formation to clear the air of imaginary enemy aircraft and to guard the convoy.

At 7:55 o'clock when guns and men were loaded and parachutes adjusted, the signal was given for the three bombers to take off. By eight o'clock all six planes were on their way to the "front" with the first flying battery in the United States Army, or as far as is known, in any army. The trip of seventy-five miles over the canal, across the western edge of Gatun Lake and thence across the jungle-covered continental divide to Rio Hato was on.

The somewhat shaky, inexperienced passengers saw below them the artillery stables at Gatun—mules in the corrals of B Battery, unconscious of their drivers in the air above them, enjoying a week's vacation from the duty of bearing gun loads at drill.

After fifteen minutes in the air, the Pacific coast was visible and soon the level plains of Chorrera, the division maneuver ground, were seen. At La Venta ranch is a wide level stretch of land and in fifty minutes, the planes were circling the scene of action and descending one by one to a perfect landing.

Six minutes after the last ship had landed the guns were being rolled by hand into position. Three more minutes and the first rounds were fired. The total elapsed time from the France Field take-off to the firing of the first round was an hour and two or three minutes. Had the battery taken the rail and motor route to its destination, it could not have hoped under the best of conditions to have fired its first round in less than eight hours from the time of entraining at Fort Davis.

The second flight was as successfully made. Six days later the battery, having completed its firing, returned to its home station by air without mishap.

The experiment proved that air transport of artillery is feasible, and is limited only by the amount of available aircraft and landing facilities near the scene of action. It is unquestionably an emergency method and not a possibility for ordinary transportation. Offering great strategic mobility, it precludes tactical mobility which must depend upon truck, tractor, or animal transportation, following the flying battery by rail and motor to join it in the field.

A sufficient number of planes will probably never be available to put the battery in the field with full personnel and supplies for protracted operations. Supply, in the main, must be over traditional ground routes, although the idea of supply of a unit in the field by airplanes for a short period is no doubt quite a reasonable premise. Any type of transport plane can be utilized with the seventy-five millimeter pack howitzer. Its six component assemblies make possible loading in a variety of ways and in all sizes and shapes of storage space. It is small and light, weighing only 1,250 pounds complete.

Ammunition is another problem, the solution of which

(*Continued on page* 142)

EXPERIMENTS WITH ROCKETS

By Edwin P. A. Heinze

THERE has been rather a great to-do over a number of rockets recently demonstrated in Germany. The daily press gave sensational reports on the performances of these rockets which were not in keeping with the actual facts, inasmuch as the reporters allowed their imaginations to dwell too much on the future. There undoubtedly is an interesting future for rockets, and progress is rapidly being made in the investigation of the problems involved. But the present stage of development by no means justifies the fanciful stories by lay-journalists, such, for instance, as the assertion that the time is at hand when mail and passengers will be able to cross the Atlantic Ocean between Europe and America in half an hour or that it will presently be possible to attain speeds of 20,000 miles per hour. All this may conceivably come about some day, but it is much too early to consider these possibilities. There are numerous nearer problems to be dealt with and earnest scientists are progressing slowly but surely along conservative lines.

German scientists are the most advanced in these investigations of rocket problems. Development in Germany some time ago reached the point at which it was recognized that the old powder rocket would not prove suitable for the propulsion of air vehicles of any kind, mainly because of the difficulty of regulating the discharge during flight and also because of the danger inherent in the employment of powder. Other fuels, including liquids, were resorted to as their storage requires less space for a given power output and as theoretical considerations, worked out principally by Professor Oberth, had shown their superiority.

The propulsive force of a rocket depends on the reaction caused by a large mass of gas leaving a nozzle at as high a speed as possible—not in the impingement of the gas on the surrounding atmosphere, as is still erroneously believed by many. It is, in fact, the selfsame action as the recoil of a gun that constitutes the propulsive force of a rocket, and a gun will have greater recoil when fired in a vacuum, owing to the absence of air resistance. Such a recoil, for instance, occurs when a container of compressed gas or air is opened. In fact, one German investigator once fitted a number of containers of carbon gas on a chassis and succeeded in traversing a short distance with the aid of the recoil caused by the compressed gas streaming out.

Much greater, of course, is the recoil when the speed of the outstreaming gas is increased by some sort of explosion. Discovery of this fact led investigators to make attempts with fluid gases, preferably oxygen, which is allowed to expand and mix with gasoline, alcohol or oil vapors and then ignited electrically. It is chiefly along this line that experiments are now being carried out. Max Valier, the unfortunate German rocket pioneer, who lost his life in rocket experiments last year, was perhaps the first to make practical steps in this direction. He joined forces with Dr. Paul Heylandt, Germany's leading expert on and manufacturer of liquid gases. Though others were beginning to experiment tentatively with liquid gases and nozzle forms, Valier and his companion had a great advantage over them in possessing experience the others lacked and by being the proprietors of valuable patents, which, although basically applicable to other industries, were found to be of importance for the development of rockets. Heylandt, who financed the mutual work, and Valier gradually developed a form of rocket operated by liquid oxygen and a fuel such as gasoline or alcohol, which today may be considered practical and safe. They decided first to bring out an efficient rocket with a powerful recoil, that is, a prime mover, before entering on flying experiments, which they considered premature. Since the death of Valier considerable progress has been made, and it appears that Dr. Heylandt and his able chief engineer Pietsch, who has been intrusted with the research work and has numerous inventions to his credit, have succeeded in developing a form of rocket with a much higher recoil than the forms developed by their competitors. These latter are considerably handicapped by the Heylandt patents preventing their developing efficient nozzles and mixing devices. The Heylandt or Pietsch rocket has attained a stage at which it is possible to effect a continuous discharge for any length of time, the force of which can be regulated continuously, as the speed of a motor car is controlled by the accelerator pedal.

The other group of experimenters, surrounding Professor Oberth, the famous theorist, and united in the Verein für Raumschiffahrt (Club for Aviation in the Universe) is also seeking to develop fluid rockets but apparently has not attained as high a degree of success. While Heylandt has consistently declined to make flying experiments before the prime-mover has been perfected, this group has simultaneously engaged in such experiments. It has its own flying ground in Berlin, but unfortunately is handicapped by lack of funds.

While Heylandt now has a good rocket or prime-mover, he has no flying body or fuselage in which to use it. He must either start at the beginning now or join in with someone having greater flying experience. He believes the construction of a flying body is not a difficult problem and he may be right; he appears content to leave this part of the work to specialists.

In this connection it is interesting to record the successful work of an old aircraft pilot and engineer, Reinhold Tiling of Osnabrück in Germany, who has developed two kinds of rocket bodies, one for mail, the other for passenger transport. Both, in model form, have been surprisingly successful and seem to be promising solutions. The rocket bodies are formed according to aerodynamical laws, and the inventor claims he can construct them with similar efficiency in any desired size. The mail rocket body is provided with fins, which, when the discharge ceases, automatically turn and form a kind of parachute. The passenger rocket body has wings folded down the sides to the tail which spread automatically as soon as the rocket stops working, transforming the whole into a glider which is exceptionally stable and glides easily to the ground. Both models functioned exceedingly well at a recent public demonstration. The passenger model went up 2,000 metres in the air and then, the wings having unfolded, came gliding down slowly to the ground, landing without the least dam-

(*Continued on page* 138)

PROBLEMS TO BE SOLVED BY THE AERONAUTICAL ENGINEER

By T. P. Wright
Vice President,
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THE subject of aeronautical engineering problems must be treated in a general rather than specific manner. It is obviously impracticable to expect from any one article a specific solution to such a problem as this with its manifold implications. Therefore, I will merely try to reason the matter out in the manner in which I myself have studied it, giving particularly the method of attack which I feel must be used for any aeronautical engineer to arrive at any pre-determined end.

The basic method of attack which I feel applies in this case and, in fact, in arriving at a solution of any problem, can be set down under the following four headings: See the Problem—State the Problem—Study the Problem—Solve the Problem.



See the Problem

The interpretation which I place here is to feel or understand that there is a problem requiring solution. Unless we admit there is something wrong it is not possible to anticipate that we can arrive at anything better. A brief review of the words of several men writing on the subject of the aviation industry, from entirely different points of view, furnishes us with a detached opinion of commercial aviation requirements. For example, last November Mr. Bogart Rogers wrote quite bitterly of the state in which he found aviation in general. Mr. Morris Markey a little later drew the conclusion that aviation is decidedly not yet arrived at the true commercial stage of development. Mr. Bruce Gould brings out the following thought in *The New Republic*: "It seems curious that our astute banker should have believed the public would fly although he wouldn't." Mr. Bill Stout in numerous articles emphasizes the need for improved safety, economy and comfort in order that there may come into existence a commercial airplane which will truly meet requirements. Also numerous editorial writers have pleaded for a design of private owner plane which would make possible a real enlargement of this market. Finally, Mr. Parlin, after a very careful analysis of the whole industry, introduces a note of optimism in the ultimate possibilities of commercial aviation if a truly safe and economical private owner plane is developed, as with such a plane now developed the coming generation will most certainly take to flying without question.

It is not necessary that we agree with all of the views expressed by each of these authors, but it is necessary that we admit those points where they have obviously struck on some feature of our problem needing improvement.

A study of cold-blooded statistics further bears out the inferences of the above writers in indicating the need for a really suitable private owner plane before an industry of any importance can be hoped for. Certainly such an industry does not exist when the records of the past several years give production of 1500, 3500, 5400, 2500 and perhaps three to four thousand airplanes for the present year.

There is a need for a reduced cost, together with the necessity for careful attention to and the courage to back convictions concerning innovations in design which may come to light. The need for facing the problem squarely and spending more effort on engineering improvements in aviation (as distinguished from other branches of industry), is magnified by the fact that no fundamental or inherited market for airplanes exists. Our industry, therefore, should unite and concentrate on the creation of a desire to fly in the general public, rather than in worrying too greatly over our own quite small problems of competition.

We must, therefore, fully realize and understand the nature of our problem and believe in our industry whole-heartedly, always envisioning better things.

State the Problem

Essentially the problem is to obtain speed with safety, comfort, reliability and economy.

Speed is essential to aviation, its raison d'etre. Without speed, and by speed I mean velocities very substantially higher than other means of locomotion, we have little excuse for aviation.

By economy is meant low first cost, low operating cost and low maintenance cost.

By safety is meant low landing speed, control at stall and almost foolproof operation.

Reliability as applied to the plane itself has reference to excellence of its power plant; excellence of its instruments for unfavorable weather condition navigation and completely dependable structure.

For comfort we must have freedom from vibration; diminution of the force of bumps; proper warmth and ventilation; elimination of noise and suitable seating and travelling accommodations.

We must, in short, combine the cost and landing characteristics of the power glider with the speed of our fastest cabin monoplanes and the comforts of our best transports.

Study the Problem

I feel we can divide our problem into two parts, namely; the basic considerations which may lead to radical improvement and the specific points of attack immediately before us.

Basically we must study the work of the really great men who are working in the (*Continued on page* 146)

ALTITUDE FLIGHTS

H. B. Henrickson

Aeronautic Instrument Section
National Bureau of Standards

Publication of this article approved by the Director of the Bureau of Standards for the U. S. Department of Commerce

AN exceptionally large number of altitude flights was made in landplanes and seaplanes, with and without payload, during the year 1930. Many interesting trials were made in light planes, and several in utility gliders. Three ships in the latter classification showed remarkable performance during the Elmira soaring meet in the latter part of the summer.

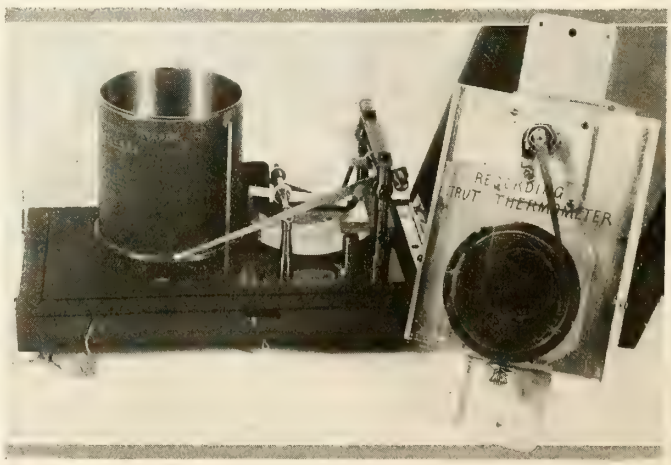
For outstanding altitude performance during 1930, the honors unquestionably go to Capt. Boris Sergievsky and Lieut. Apollo Soucek, U. S. N. The former, at different times, captured four world's records carrying various payloads in a Sikorsky seaplane. The latter established a supreme altitude mark, a world's major record of 43,166 feet in the Navy's Wright Apache landplane.

Looking abroad, one notes that Domenico Antonini of Italy established three landplane records in a single flight by carrying eleven tons of payload to an elevation of more than 10,000 feet; and that Woldemar Voight of Germany, flying a light landplane of the third category, exceeded by a considerable margin the figure established earlier in the year by D. S. Zimmerley of this country; while Wilhelm Zimmerman, again of Germany, in a Junkers light seaplane of the fourth category substantially raised this altitude record.

A new F. A. I. ruling regarding the breaking of altitude records became effective January 1, 1930. This international body specified that altitude records could not be broken by a difference of less than 200 meters (656 feet). The former amount had been 100 meters or 328 feet.

The first altitude flight of the year 1930 was made by D. S. Zimmerley on February 16, at St. Louis, Missouri, in a Barling NB-3 low-wing monoplane, a light ship of the third category. It was powered with a Lambert air-cooled motor of ninety horsepower. The pilot, wearing a fur-lined flying suit, and equipped with a parachute, compressed oxygen and electrically heated goggles, took off from the Forest Park field in the afternoon. He climbed steadily until at 10,000 feet the plane was lost to the view of observers as it passed through a layer of clouds. At 15,000 feet a strong west wind was found which increased with altitude. From here on, instead of spiraling in wide circles, the pilot found it necessary to fly directly into the wind with the throttle wide open. Even with full power, the ship drifted eastward over Illinois. At an altitude of 16,000 feet the oxygen supply was started, and used continuously until the maximum altitude was reached. At this point the pilot noted an altimeter reading of approximately 27,000 feet, and a free-air temperature of –32° Fahrenheit. After about two hours, the oxygen supply began to run low and the ship had to be nosed downward, continuing to head into the west wind. When the pilot came through the obscuring layer of clouds and obtained sight of land, he found himself just east of the Mississippi River. A landing was made at the home airport after a flight of two hours and ten minutes. A sealed barograph, previously installed in the tail of the ship by Major Luke Christopher, secretary of the contest committee of the National Aeronautic Association, was removed, and afterwards calibrated by the Bureau of Standards. The results of a flight-history test showed that a new altitude mark had been established for light planes of the third category. The lowest pressure recorded was 287 millimeters of mercury, which is equivalent to 7,338 meters, or to 24,074 feet in the F. A. I. standard atmosphere. This figure exceeded by 1,824 feet the former mark set by Paul Baumer of Germany on July 8, 1927.

At this point it may be well to say a word or two about the testing of barographs used in altitude flights. The technique of testing such instruments has been described in considerable detail on page 885 of the May 1928 issue of AERO DIGEST. Only one barograph of each flight is given official tests. If two are carried in flight, one is arbitrarily designated as "official" and tested. The extra instrument is carried only as a safeguard against failure of a single barograph. The official instrument is tested by subjecting it, as nearly as possible, to a repetition of the temperature and rate of change of pressure experienced in flight. In short, the barograph is given a "flight-history" test. When the position of the stylus of the instrument is at the lowest pressure indicated by the flight trace on the smoked chart, the pressure in the test chamber is determined by reading a standard barometer. In accordance with one of the recent regulations of the Federation Aeronautique Internationale, this pressure, if observed to a fraction of a millimeter, is taken to the nearest half-millimeter of mercury which represents the accuracy obtainable with available barographs. Further, this value of pressure is converted to altitude in meters, and then to feet, by the use of the F. A. I. standard atmosphere adopted in 1920.



Barograph and strut temperature recorder used in altitude flights

The Bureau of Standards has always endeavored to determine the

lowest pressure attained during a flight with an accuracy of possible one-half or at least one millimeter of mercury. To obtain this accuracy it is necessary among other things that the temperature of the instruments should be the same during the test as during the flight.

The latest regulations of the F. A. I. require that instruments be tested at a temperature of +15° Centigrade without reference to their temperature during flight. This regulation leaves much to be desired, since large errors usually remain in the value of the pressure so determined. Thus, for example, one instrument tested not long ago indicated that the lowest pressure attained during the flight was 264 millimeters of mercury (25,942 feet) when tested at +20° Centigrade, and 269 millimeters of mercury (25,525 feet) when tested at —20° Centigrade, the latter being the temperature of the instrument at the greatest altitude of the flight. Another instrument, tested some time in the past, indicated 160 millimeters of mercury (36,771 feet) at +20° Centigrade, and 152 millimeters of mercury (37,854 feet) at —40° Centigrade, the latter corresponding more closely with the pressure and altitude actually reached in flight. It is therefore evident that temperature control during testing is essential, if an accuracy even approximating one millimeter of mercury is to be attained. The instrument's temperature can be estimated with a fair accuracy if the air temperature at the ground level and the place of mounting the instrument in the airplane are furnished, together with the usual data. A more satisfactory method is to have the lowest temperature of the instrument recorded during flight. This is now being done in many cases by means of a minimum-temperature-recording thermometer devised by the author. A bimetallic spiral is used, having one end fastened securely to the base of the barograph and the other end free. A stylus arm is attached to the free end, the tip point of which makes a temperature trace upon a flat, camphor-smoked aluminum plate.

Let us return to our account of the flights. On February 22, Domenico Antonini of Italy made a memorable flight in a Caproni Ca.90 biplane with a payload of 10,000 kilos (22,046 pounds). This huge landplane, powered with six Isotta-Fraschini engines of 1000 horsepower each, took off from Cascina Malpensa on a flight that was prolonged for one hour and thirty-one minutes, and incidentally established a duration record in its particular class. At the top of the climb, the pressure reading determined from the barograph was 506 millimeters of mercury, which is equivalent to 3,231 meters, or to 10,600 feet. This noteworthy single flight established several world records—for altitude carrying payloads of 7,500 kilos and 10,000 kilos, for duration with this load, and for carrying the greatest payload to an altitude of at least 2,000 meters (6,562 feet).



Lieut. Apollo Soucek, U.S.N., world's record altitude holder

On February 28, at New Castle, Delaware, George Haldeman of this country made a flight in a Bellanca cabin model, equipped with a Wright engine of 300 horsepower, supercharged. The trial was made in order to certify the maximum altitude obtainable with the ship. During the flight compressed oxygen was used at altitudes above 16,000 feet. Everything performed satisfactorily during the flight. An excellent trace was made on the barograph chart, the topmost point of which, when checked against the standard barometer, indicated a minimum pressure of 215 millimeters of mercury, which is equivalent to 9,282 meters, or to 30,453 feet. A few weeks later, Miss Elinor Smith piloted the same ship to a somewhat lower altitude.

On March 4, Captain Boris Sergievsky made a trial from North Beach, Queens, New York, in a Sikorsky S-38 amphibion from which the landing wheels had been removed, thus converting it into a true seaplane. The ship, equipped with two Pratt & Whitney Hornet engines, each of 575 horsepower and supercharged, carried 2,000 kilos of sheet iron which served as payload. After a run of eighteen seconds, the plane took off and remained aloft for one hour and twenty minutes, circling around over Queens and Long Island.



Capt. Boris Sergievsky and Major Luke Christopher

Tests of the official barograph showed a minimum pressure of 357 millimeters of mercury, which is equivalent to 5,811 meters, or to 19,065 feet. This was a new world's record, exceeding by 3,228 feet the former mark established on May 15, 1929 by Lieutenant Paris of France.

On March 6, Pilots Crosswell and Johnson at Roosevelt Field, Long Island, New York, made a commercial altitude flight in a Curtiss

(*Continued on page* 134)

EDITORIALS

N(othing) A(t) A(ll)

ANOTHER year has passed with no sign of life from the poor old N. A. A. Were it an individual the doctors long since would have pronounced it too near death to offer hope. Probably it has fewer members than it had last year. Certainly it has less influence among those engaged in aviation's various phases than at any time in its history. But we all know there is need for an organization to do exactly what it was devised to do.

Material is at hand out from which might easily be built an energetic organization that would function. Only leadership is lacking which would pull existing groups together and create something really worth while. In 1926 the publisher of AERO DIGEST spent months trying to make the controlling powers of the N. A. A. see the necessity for a junior organization. They failed to sense the opportunity which lay in organization of the nation's youth, then of sixteen, seventeen, and eighteen years, who at this time would be voters able to assist, especially in legislative matters. *The American Boy,* an excellent youth's publication, saw the possibilities and organized the Airplane Model League of America. This now has grown into a membership of more than 400,000.

At this moment the Model League is in a position to be absorbed by the N. A. A. We have a glider association, with clubs scattered throughout the country, which also could be brought in, and there are possibly a thousand other clubs in the United States which concentrate on aviation. Their memberships range from about twenty to several hundreds each. They all could be affiliated. A plan could be worked out providing real coöperation with the Exchange Clubs, which in four years have done more for American aviation than the N. A. A., under its present management, could do in upwards of four centuries.

All these could be put together into an organization of over half-a-million members to begin with.

Two of the most important members of the N. A. A. Advisory Board recently have resigned because of the high-handedness of Lighter-than-air-Bingham and his highly gaseous gang. A sample of their work was the award to Cleveland of the National Air Race contract for five years without consulting all the members of the Advisory Board, or even of the Contest Committee. Cleveland is all right, and is to be congratulated on its good sense in seizing on the contract. It is an airminded city and will do a good job every year; but the need is for a thoroughly air-minded nation, and the location of the National Air Races should not be stationary for five years.

We've got to clean the N. A. A. or start a substitute for it. It is possible to find a way to do the former, but not while Bingham and his gang are sitting at the controls. So there is indicated the first work to be done.

Affiliate all the organizations now existing, including the two pilot groups. These pilots, by the way, would be especially qualified to handle the F. A. I. in the United States. They know more about such matters in a minute than the present N. A. A. can learn within ten years.

In two months the annual meeting of the N. A. A. will come. Now is the time to make plans for it. Members of the N. A. A. will not be serving the best interests either of themselves or of the nation by letting it go by default as other annual meetings have been allowed to go.

ANTI-AIR PROPAGANDA

SOMETHING dangerously close to anti-patriotism lurks in the mental offing when some of the pro-Navy anti-Air Force minds begin to function. One finds exactly that in the New York *Tribune,* which gets much of its thought and more of its prejudice from Newport, not only a fashion Paradise but a Naval Station. Under the heading "Battle Postponed, Wet Grounds," this newspaper, on the morning after the great air demonstration over New York City, editorially notified its readers, with an audacious mendacity which would have been more serious had it not been so absurd, that the vast display had been delayed because torrential rains had wet the flying fields, hindering take-offs. It ignored entirely the fact that this impressive event, magnificently managed and profoundly a success, was after all a "big parade" and not a desperate defense against attack by enemy planes launched from hostile ships at sea.

"Drenched flying fields and low ceilings are a menace to flying at all times," it said, pretending to be sorry, but keeping the delight out of its type with difficulty, and at the same time, forgetting to be fair.

As our would-be national social arbiter, the New York *Tribune* is quite right in fighting for the Navy. A battleship fleet in time of peace is a great social asset. Fliers are not taught, as are the lads at the Navy's own Annapolis, just how to bow to pretty girls (and mature matrons), how to kowtow to visiting royalty, how to dance and strut about a quarterdeck. If they know such things, that's good, but they are not requisites of flying.

The recent splendid spectacle of the massed planes flying in orderly procession of squadron after squadron was quite different from what it would be in fighting days. Everyone except the *Tribune* knows that. "Drenched flying fields and low ceilings are a menace to flying at any time," the *Tribune* says, and thereby shows its elemental ignorance. Wet flying fields are possibly a nuisance to war fliers, as wet decks and moderately heavy winds and seas may be to sailors, but they're not an inexorable obstacle in either instance. Wet fields never kept one plane out of the air even in World War days, when flying was a kindergarten compared to what it is now. In warfare the planes would not have been flown low, but high above that advantageously low ceiling, whence mysteriously and terribly they would have pounced upon the enemy's forces if they approached. Others, in small groups, would have sought out their objectives, the great enemy ships which give the *Tribune* such cold shivers even when it only thinks about them, and on them would have peppered high explosives, poison gas, with such positive certainty that those ships would sail the seas no more, their long-range guns forever silent.

None but an old-line Naval officer, or a middy who doesn't think he'd just exactly like the air, could have inspired the pitiable blast which was too silly even for the Society Editor to have written.

CONNECTICUT—AN AVIATION LEADER

Rapid Progress Made Under State Aeronautics Department

By Paul Becker

IN THE eastern section of the United States at least, no state has shown a more progressive spirit in solving the problems of the new aviation industry than the State of Connecticut. It was the first state in the Union to have a Department of Aeronautics; the first state to have a state-owned building for its aeronautical activities; the first state to own a state patrol ship —and now the State of Connecticut has attained first place in the manufacture of aeronautical products, the value of its products exceeding those of any other state.

In no small measure the State's leadership is due to its Commissioner of Aeronautics, Clarence M. Knox, who has guided the aviation policies for the past ten years. Connecticut's aviation laws date back to 1911, and it is believed that the State now has the most complete state aviation law operative in the country. The Connecticut lawmakers have been open-minded and have accepted the recommendations of aviation experts. As a result, while the Connecticut aeronautics laws are complete and thoroughly enforced, they do not interfere with the proper operation of aircraft or usurp the functions of the Federal aviation supervision.

In Ex-Governor John H. Trumbull the State also had the guidance of a man who, probably more than any other governor, appreciated the value and problem of aviation. An active flier himself, a regular user of air transportation in the discharge of his official duties, Governor Trumbull was able to appreciate the value of this fast means of transportation, and the important industry which it is building.

The 1927 Connecticut State Legislature created the Department of Aviation (later changed to the Department of Aeronautics). Up to that time aviation control had been under the Commissioner of Motor Vehicles. A Commissioner of Aviation, Clarence M. Knox, was appointed by the Governor to build up the aviation department. This Commissioner was empowered by the law to make, alter or repeal regulations governing the administration of all statutes relating to aviation—an unusual power for a law making body to give, but necessary in a new industry such as aviation. The regulations instituted were all based on considerations of safety, not only to the pilots themselves, but to the public in general. Rules were put in force such as the compulsory wearing of parachutes by students and instructors, checking of parachutes regularly, installation of certain safety devices in ships, approval of fields used for "barnstorming", etc. Many of these rules were used as the basis for Federal regulations which were adopted later.



Commissioner C. M. Knox, Deputy H. W. Generous before Connecticut's "Corsair"

The work of the Connecticut Department of Aeronautics may be briefly summarized as follows:

First: Registration and regular inspection of all aircraft operating within the State.

Second: Licensing and supervision of pilots.

Third: Check up on all flying activities.

Fourth: Supervision of flying facilities.

Fifth: Education of public on air transportation, and stimulating of interest in production of aircraft and accessories in the State.

All aircraft operating within the State of Connecticut must be properly registered by the State. No attempt is made to control ships operating in interstate commerce, or planes which may pass through the state, although, of course, these ships must not violate the Connecticut flying regulations, which are closely in accord with the Federal regulations. The Federal laws cover only planes operating interstate, and aircraft used for pleasure or non-commercial purposes are not required to be licensed under the Federal rulings. In the State control of these types of ships then, there is no overlapping of the Federal control. Furthermore, it is in the private and non-commercial planes and in the small commercial operator that there is the greatest tendency toward laxness and the greatest liability to the public, and there is, therefore, a definite need for such regulation as Connecticut has devised.

Every Connecticut registered airplane must meet the State's requirements as to safety factors and general condition, the State requirements being in accord with those established by the Federal Department. When a ship is presented for registration, it undergoes a thorough inspection and check requiring from three to four hours. Thereafter, a close inspection of the plane is made semi-monthly, and if the aircraft is not being properly maintained, the registration will be cancelled. Even a slight deficiency means a "black mark", and three such deficiencies mean a complete revocation of the plane's registry in the State. And when a plane, in the opinion of the State Inspector, has reached the limit of its life from the safety standpoint, further use of it is prohibited.

In the Year 1924-1925, 33 planes were registered, and in the Year 1929-1930, 175 planes, the increase indicating the expansion of this phase of the work.

On the Personnel Inspection Department rests the responsibility for determining and maintaining the airworthiness of the human factor in aviation in the State. The selection

(*Continued on page* 152)

INVENTION TO THE RESCUE

by Caldwell

WE HEAR frequent complaint that the airplane of today is no more than the original Wright of 1903 with refinements and additions. "Fundamentally, the thing is unchanged," it is charged. "Same old principles, expanded." This is always mentioned in a grieved, hurt tone, as though someone was to blame for the monotony.

The sad picture is presented of the original Wright being pulled out, pushed in, shoved here, dented there, and twisted into a variety of shapes—through all of which we still can see peering forth the time-worn visage of Kitty Hawk. In short, what irks the boys is that the first Wright apparently took its place in the world as a sort of aerial concertina on which various engineers have played a great variety of tunes, distorting the affair, it is true, but not enough to twist it out of all resemblance to the original wind instrument.

Only the other day an old pilot was saying to me, "Well, they've added thick wings, experimented with multitudes of wing curves, put on wing flaps, and variable cambers, and added more horsepower. But fundamentally, it's the same old Wright." He was almost crying in his disappointment. "And what did you expect it to be?" I asked. "I don't know," he said, "but it should have advanced to something radically different by this time."

Such, it seems, is the general verdict—"It should have been something different by this time." Just what it should have been, nobody seems to know. That the modern locomotive fails to differ fundamentally from Stephenson's "Rocket," or that the "Leviathan" is not a radical departure from Fulton's steamboat, seems to have escaped notice. Yet these modern productions, like the modern telephone, telegraph, and electric motor are merely further and enlarged applications of the principles discovered and used by earlier inventors in the first locomotives, boats, telephones, telegraphs, and electric motors.

What is becoming more and more apparent is that the original principles of heavier-than-air flight were sound. And when you get hold of a sound principle all you can do is to apply it. You may work out refinements in the application; you may even discover new principles and add them to the ones previously discovered. But no matter whether you slice it or grind it, your original principle is still there, easily recognizable. Why shouldn't it be?

Yet I don't know, off-hand, of any invention other than the airplane, that evokes such whole-souled dissatisfaction in its friends. One pilot says it should go faster; another says it should land slower; one says it should take off with a shorter run; while another adds that by this time it should be taking off with no run at all, and go straight up into the air. On only one point are they all in agreement—it should cost less.

Well, folks, in this treatise I shall try to accomplish two objectives. Very briefly I am going to attempt to defend the airplane against the mutterings of its friends, and then I am going to hold out hope to those who want to see the airplane "radically different."

You know, we may arm ourselves against our enemies, but what protection have we against the well-meant efforts of our friends? I really believe that the poor old airplane has received more damage from its best friends than it ever has suffered from its avowed enemies. If you will recall to yourself briefly what sundry pilots and engineers have done to and with the airplane, trying to help it along, I'm sure I need devote no space to recounting the wrongs the airplane has endured at the hands of its willing helpers.

You know, it seems to me that instead of finding fault with the airplane and wondering why it hasn't evolved into something entirely different from what it started out to be 28 years ago, we should be glad that it has progressed in an undeviating line along the path that its first principles laid down for it to follow. It started out on the assumption that a cambered surface propelled at a required speed through the air would acquire enough lift to carry itself, the propelling mechanism, fuel to run the mechanism, and a certain load of humans, goods, or what have you. The Wright Brothers proved their and earlier experimenters' assumption to be correct, and thus the assumption became a proved principle of flight.

However, everything, even a principle, seems to have something undesirable about it. In order to get lift, you must maintain speed. It may be fast or slow speed, but still it is speed. The surface won't lift itself unless it is moved through the air. Cease to move it at the speed it requires to induce lift, and down it must come. That's the principle of the thing and we can't get away from it. Who wants to? Well, practically everybody.

Of course, we want all the speed we can get to go from here to there—but when we get there we want to dissipate that speed before we land. That's about the size of it. Fly there at 300 miles or more, stop, then land. Not land at sixty, roll along, and stop. Stop right in the air, pick your spot, and settle down on it like a bird. There's your ideal airplane. It's what everybody wants, apparently.

While that's the ideal, not all of us are idealists. Many are content with less—a lot less. If we can get 200 miles an hour in the air, we are very pleased if the plane will land at sixty. If it won't lift off with a full load in a hundred feet, we're delighted that it does so in six hundred. In fact, I've flown in planes and felt thankful—and surprised—that they got off at all. I could name some, but we'll let bygones be bygones.

Of course, with these long runs



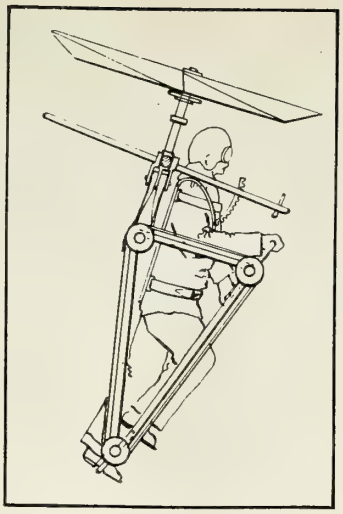
Times-Wide World Photo

The spirit of aeronautical invention —a noble contribution to the science

before flight, and these comparatively fast landings after flight, our airplane, taking it by and large, big and little, slow and fast, needs a large field for a terminal. And there aren't any large fields in our cities. All of the large ones are miles from the center of activity. And that's another thing we have against the airplane—after 28 years it not only needs a large field, it needs a much larger one than it needed in 1903.

Therefore, some of us look at our airplane as much as to say, "What's the matter with you, anyhow? You're 28 years old, and have worse tricks now than you had when you were born. We give you wheel brakes, and still you land at sixty, when you used to land at thirty. Confound you! Why don't you stop before you land?"

The answer is long and involved, but may be abbreviated to this: The same old principles are still on the job. Not only that, they look as though they always will be. Leaving the helicopter and the autogiro out of the discussion—because they are not airplanes in the usual sense—we may as well face the fact that our airplane operates on a basic principle that will go through the years unchanged. We may, and do, modify its application, but we don't change the principle. Change the wing camber in flight, add flaps, change propeller pitch, do anything your inventive mind suggests, but your airplane still has to get up speed before it will fly, and must maintain speed—speed of some degree—until after it descends from the air. We may make it get up a little sooner and land a little more slowly, or even a lot slower, but we can't make it take off vertically and land the same way. Because it's merely the original Wright with an engineering degree. It's our first old crate, back from a finishing school and an educational trip abroad.



Oughto-lift sport model designed for "One people and two dogs"

You know, by the patience and ingenuity of breeders, the barnyard fowl of centuries ago has evolved into several mighty fancy and varied types of bird. They've got all kinds, from big fat Plymouth Rocks, that make wonderful broilers and roasting chickens, to White Wyandottes, that are great egg-layers. Some are famous for their meat, others for their eggs, and yet others only for decorative purposes. They even have bantams the size of our light planes. But fancy and varied as all those birds are, you can still see they descended from the old barnyard fowl, which in turn came from the wild game hens. None of them have evolved into song birds or eagles. They're still hens.

Same way with our airplanes. We have the big fat Fords, like the Plymouth Rocks; we have the lean fast birds like the Lockheeds, and Ed Porterfield and Bill Stout have been breeding bantams. But the whole flock of them are descended from that old barnyard fowl the Wright Brothers raised at Kitty Hawk, and they have all its main features. We've refined the breeds, raised them specially to bring out certain characteristics we wanted, but after all, they're still of the same species. They haven't turned into elevators, for instance.

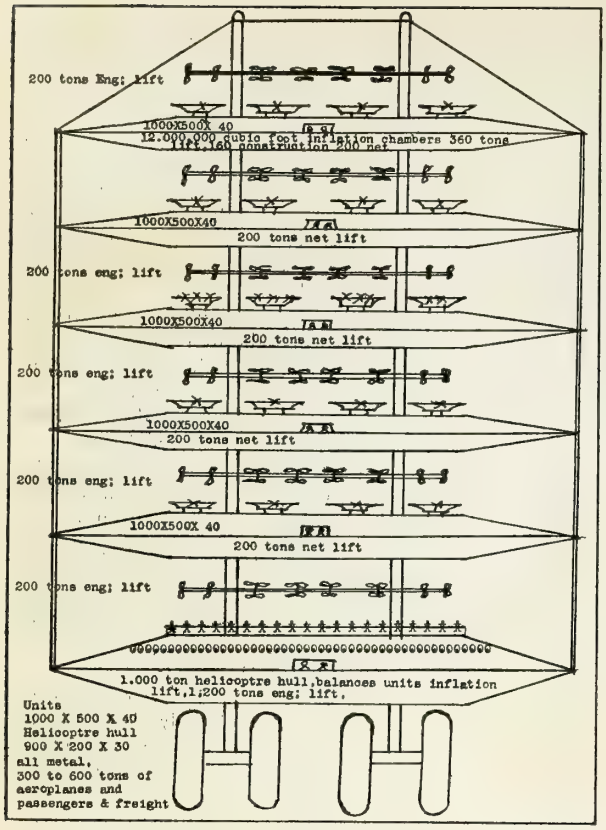
Instead of feeling discontented because an airplane is still an airplane after 28 years, and looks as though it's always going to be an airplane, and nothing else, I think we ought to feel mighty glad it has progressed so far and so fast. The other day I had a flight in a Curtiss Condor, about sixteen years after I had my first flight in a Wright Model B. You birds who complain that we haven't got far should make a comparison like that. Or take a trip to Washington and glance at the exhibits in the Smithsonian, and then visit an airport. We've made such progress that it's startling, and we'll continue to make it. But a hundred years from now airplanes will be flying on the same principles the first Wright flew on. That old Wright will still be peeking through the paint on the new job.

Well, so much for the modern airplane. If anyone feels discontented with it, I have plenty of hope for him later in this article. I have dope here that will amaze him. It shows that the inventors are busy doing just what a lot of you seem to want—working their heads off to produce "something radically different." I'm going to introduce them to you to cheer you with the thought that new things are on the way.

But just a paragraph on the much-discussed subject of Airplane Safety, with my frank opinion for what it's worth. I believe that a modern airplane, properly designed and built, properly serviced, and properly flown in suitable weather is a reasonably safe vehicle in which to be transported. I don't believe or pretend to believe that it is as safe as riding in a Pullman car on a first class railroad; in fact, I doubt if it ever will be. But considering the difficulties aviation has had to contend with, and the high speed we attain, I feel that we have achieved more safety than any of us in the business fifteen years ago honestly believed that we would achieve in this space of time. We'll make it safer every year, I think, with improved design of equipment, the use of improved materials—such as new alloys yet to be produced—and the accumulated experience of operators. The operation of aircraft, in fact, calls for more improvement than the aircraft itself. But take it all round, airplane travel is reasonably safe—which is a lot more than we could say even five years ago.

Now folks, the fond hope of every writer, be he ever so humble, is to please all of his six readers. He never succeeds, of course, but the poor soul hopes to, if for no better reason than that if he pleases none of them he ceases to eat. So we see him pathetically scurrying about the keys of his portable, like a nervous mouse, tapping down little words that he hopes, usually vainly, will interest or entertain. I, for instance, reading over what I have written so far, know that I have failed to satisfy all of you—in fact, the horrid fear grips me that I have pleased nobody and hence am in danger of having to stop this sort of thing and go to work at something useful, like street-cleaning.

So to capture the interest of those who are still dissatisfied with the airplane, even after all I have said in its favor, I hasten to inform them that "something radically different from the first Wright" is on the way. Various inventors have written in and said so. Among them is Hugh T. Dunn, of New York, who wrote the glad news to the Editor of AERO DIGEST, who passed it along to me, and I in turn thankfully pass it along to you to gladden



The inventor describes this as "the Burbanking combination of independent self-contained airplanes, balloon airships with helicopter hulls, and the more the merrier"

your soul and enrich his treatise. What is presented here is unchanged in any particular. The only liberty I have taken is to delete several paragraphs, because after all I don't suppose you want to keep on with this all night.

"Editor of AERO DIGEST, Dear Sir:

"Single unit planes will never be successful, they have gone with the buffaloo in the people's mind and they will never come back, even should Lindbergh circle the earth. Dump them down at Kittyhawk where they are supposed to have originated. The only prospect for safe aviation is to burbank all aviation precedent and combine several independent self-contained units, with helicopter hulls, if with 6 of them 4 can fail and if 10 of them 7 can fail and 3 function. You know, Burbank combined the spuds and all development for the past 30 years has been merging combines and why not apply this formula to aviation, sure it eliminates the risk for acrobatic nuts, as it provides safety. It also makes blank cartridges of all of the big shots in the aviation game with present single unit aeroplanes.

"I have been trying to tell these promoters that fact for the past 30 years. I designed this burbank combination in 1899, sent planes to the World Fair, St. Louis, 1904, to Admiral Moffet, 1918. To the Navy contest, 1927, and they have adopted the foreign zeppelins, also single units.

"But single units have gone like the buffaloo, that mysterious heaven in the unknown darkness. You may have exhibitions and have boy scout contests and kindergarten lectures in schools, but the people will not ride in your incinerating, cremating single unit aeroplanes.

"I have applied for the patent on the burbanking combination of independent self-contained aeroplanes, balloon airships with helicopter hulls, and the more the merrier, as they all cannot fail to function. They will cost like hell, but will realize enormous profits, and are elastic 500 ton hulls, 1,000 tons, 2,000 tons, 5,000 tons, 10,000 tons, and you will see 20,000 ton combined airships, also hot air airships from the engines' exhausts. Figure it out and tell your bum writers to find out where the buffaloo have gone. Truly yours, Hugh T. Dunn."

The inventor very kindly furnished us with a sketch and detailed description of his revolutionary system of "burbanking" everything that flies into a huge garage that is to travel through the air. You will note from the drawing that the flying garage contains, among other things, six complete Zeppelins and some 70 engines turning propellers that pull upward. The whole affair, mounted on four wheels, goes through the air as a unit of from "300 to 600 tons of aeroplanes and passengers." In his detailed technical description, Mr. Dunn says, in part—I just haven't space for all of it, unfortunately:

"I have applied for a patent on this dirigible burbanked combination aeroplane garage hangar, for to make these aeroplanes absolutely safe while in the air, they will be firmly connected with brackets and hawsers, on the decks of this combination dirigible garage that there will be absolutely no danger of their falling off.

"These aeroplane navigators have to be tuned up with hooch, for to keep on risking their lives navigating one way single unit aeroplanes, but by storing them on these dirigible hangar garages, there will be absolutely no danger for them, and they will be glad to be carried in these aerial dirigible garages, for they are composed of several independent units, and should two-thirds fail, one-third will function for repairs and safe landing, and the planes can take off, unload, and with thousands of parry schutes, they will be safe, and when the public sees how safe these aeroplanes can be carried on these dirigible plane garages, they will also patronize these aeroplanes, while on these dirigible garages, these combination aeroplane garages can rise up vertically, navigate horizontally, and descend vertically anywhere on land or water or hover over, and land with elevators.

"I designed these dirigible aeroplane garages and hangars in 1899, and figured 50 years before aeroplanes would adopt them for absolute safety, while navigating the air, and have broadcast the plans for the past 30 years, and at last I believe that their merit will be tested and proven. I applied for the patent Jan. 1929, and hope to have it allowed, as it will make these aeroplanes carried on the decks of this garage hangar absolutely safe. I include a sketch of this aeroplane combination dirigible garage hangar, and you may perceive the prospects of its merit, and visualize a geegantic construction, and the vertical masts, 3 foot in diameter every 50 foot, 360 foot high, a 5 foot diameter mast for the elevator. These masts are utilized for various requirements, power distribution, exhaust engine distribution, oil, water, gas storage and sanitary exhausts from toilets and bath rooms on each hull to a tank in helicopter hull that has valve exhausts for evacuation at intervals.

"Visualize geegantic flat bevel edged dirigibles constructed on tubular cantilever light metal framing, with sectioned and divisioned (*Continued on page* 136)

AIR—HOT AND OTHERWISE

Make Him Chief
He's Earned It!

By Frank A. Tichenor

BACK in March, 1927, AERO DIGEST told the story of a boy who nearly thirty years before rode a bicycle from Washington, Connecticut, to New York. He wanted to enlist in his country's fighting forces. Washington, Connecticut, unrenowned then, remains so today. But even to the multitudes the man who was that boy is almost as well-known as Washington, D. C. The boy was "Ben." The man is Brigadier General Benjamin D. Foulois.

New York City was again Foulois' objective recently. This time he wasn't riding to it upon a bicycle; he was riding in a plane as the commander of the greatest air armada in the world's history. Then, from the General Headquarters at Mitchel Field, he directed the unparallelled maneuvers which thrilled the multitudes of the metropolis and of other cities of the East. It intrigues to recall that small boy upon a bicycle and then to consider this astonishing commander of the forces of the air. Progress. Personality. America. Management by a real manager—for there were hard days of flying for that vast air fleet, mostly in inclement weather. Yet everything was as smooth as oil, clicking like clockwork.



Acme-P. & A. photo

Brig. Gen. Benjamin Foulois

It was characteristic of General Foulois that during the vast pageantry he sat at a quiet, remote desk, in a dim, simple workaday room, instead of making the fine gesture of flying at the head of the unique and mighty demonstration which was under his command. He never celebrates with firecrackers and flags. He celebrates the nation and its air service. He makes no grandiose gestures. He is a thinking, acting, working, flying soldier, with no nonsense in his personal protoplasm.

Since his start as an enlisted man in the United States Army just before the Spanish War (1898), his advancement never has halted. It has been as orderly as that of the vast air fleet, undeviating, unsensational, not inexorable, for he has helped and never hindered his associates.

Steady progress since March, 1898, when the Connecticut boy first flushed before an Army recruiting officer, with the Spanish American War impending and the engineers needing bright young men. Service during the war in Cuba made a seasoned soldier of him, and left him, when the armistice was signed at Santiago, a sergeant in a regiment of U. S. Volunteer Engineers. He made a fine non-com.

He had had rough training. The boy upon a bicycle had ridden straight into a war, small but ugly beyond most big ones. Full of problems for the individual soldier, including those of working without anything to work with, of keeping fit without good food and in the midst of disease horrors of fighting hostile Spaniards for a day or two and a hostile climate for a long, long time—a climate oozing horrible, mysterious Miasma. Three years later Foulois was made a second lieutenant of infantry. Then one of those long periods of peace which do not offer many opportunities for soldiermen. Finally, in 1908, came a commission as first lieutenant in the Signal Corps.

There was casual gossip, in those days, that some time the curious invention of the Wright brothers might be important in warfare. The airplane captured this young officer's attention. When the old-liners sneered at it (as they did and as some still do) he regarded it with thoughtful eye, and as soon as he could get an opportunity, climbed up on one of the curious contraptions.

While others scoffed he saw the fact that in the airplane was embodied the greatest weapon of offense or defense that mankind had yet devised. Eagerly he sought and exultantly he gained the opportunity of being taught to fly by the Wright brothers. Today he is the only one remaining in the service of all the officers instructed by these great Americans in the art of handling the crude early planes.

Having come up from the ranks he may have been without something contemporaneous West Pointers had, but he had something better, which not all of them possessed—an open mind. The air! It fascinated him as a theatre of soldier-action. What a privilege to look down on the enemy so you could bomb him from above!

In 1908 he operated the first dirigible bought by the Army. In 1910 he operated Army Airplane Number One, with eight enlisted men to help him at the task of putting it together every time it was apparently washed out in one of its many crashes.

For such repairs, incidentally, the Congress of the nation voted $150. Congress lacked the vision that the young man from Connecticut possessed. The sum was not sufficient. To it Foulois added $300 from his salary as a first lieutenant. In 1911 he adapted radio to airplane use.

His World War service was distinguished, for he was Chief of the Air Service, A. E. F., as well as rendering distinguished service on the European War Council and at the end of the war as a member of the American Section of the Peace Commission.

No step of our fighting air development has been made except it has had its timorous little hand in the strong, firm, guiding grasp of Benjamin D. Foulois. Pilot of the first Army dirigible. Pilot of the first Army plane. Commander of America's fighting planes upon the World War front. Organizer and commander of the world's greatest mass air demonstration above the Atlantic Seaboard and cities of the Middle West the other day.

Incidentally, before he was made Assistant Chief of the Air Corps, he served in Washington, after the World War, then went to Berlin as air attaché for the United States, then commanded Mitchel Field and the Materiel Division of the Air Corps. An interesting rise. His apprenticeship as private and non-com was brief—only three years. Then a second lieutenancy and flight in the original unbleached muslin and spruce bug which went into the air with sputtering internal combustion (*Continued on page* 132)

BRAUNSCHWEIG, CRADLE OF GERMAN AVIATION

By James Hoeck



Physical fitness is an essential in the German pilot's training

BRAUNSCHWEIG is a perfect example of that well-remembered line from the Persian poet about the rose never blowing so red as where some buried Cæsar bled.

A picture of the fallen Von Richthofen, Red Knight of Germany, hangs in the "common room" of the flying college; the memory of that gallant peace knight of the skies, Baron von Huenefeld, is still fresh among the aviators of the Vaterland; the present school itself has arisen from the ashes of the demolished air base of the World War.

The men at Braunschweig welcomed back Captain Wolfgang von Gronau from his flight to America, with more real tenderness than could possibly have been bestowed upon him by all the multitudes of Broadway and Pennsylvania Avenue. The few words of commendation from his co-directors at Braunschweig and at the sea school at Warnemunde probably meant more to him than the heroics of Presidents.



Ready for a flight in a Junkers cabin "classroom"

To the airmen of Germany this flight symbolized the renaissance of German flying. The air school that sponsored the flight is perhaps one of the major developments in Germany's complete recovery.

The accompanying illustrations tell much of the story of Braunschweig, but it must be borne in mind that this college is only one of four training centers for commercial pilots, the other land base being at Schleizheim and the two seaplane colleges at Warnemunde and List auf Sult, on the East and North Seas. Visiting the air training base at the instance of the able aviation editor of *Vossiche Zeitung,* Herr Kleffel, I think I was the first American writer to pass through the modern German air base in some years. Also, although Braunschweig is a little-known German city tucked away in a little-traveled area for foreigners, it is a convenient stopping place on the way from Berlin to Frankfort or to Paris, and lies about 120 miles southwest of the capital.

Supported jointly by the German airline, Luft Hansa, and by the government, the four flying schools mentioned are under the direction of three distinguished German aviators and aeronautical engineers. The director of the Braunschweig school is Erich Wilck, who is noted for his long years of service in aviation in Germany. He has not participated in any of the more spectacular flights, but has won renown at home for his thorough knowledge of all types of landplanes and his skill as a pilot. Captain Von Gronau himself heads the corps of instructors at the Warnemunde sea school, although his daring flight was sponsored by the Braunschweig school. The third of this triumvirate of German aeronautical educators is Carl Bolle, former Oxford student, who is in charge principally at Schleizheim bei-Munchen.

Characteristic German thoroughness is shown in all phases of training the student pilots. Whereas training at most American schools is measured in terms of weeks and months, the course of instruction here is a matter of years. the students undertaking the work after preparatory technical training usually at high schools and universities. There is really nothing in America that corresponds to the all-'round four-year course at Braunschweig. It might be added that the four schools described here cover the field of heavier-than-air craft only and that special schools likewise are maintained by the Zeppelin company at Friedrichshafen, and more informally by the *Sportflug,* or flying clubs, and the glider associations.

Re-established as recently as 1925, Braunschweig already has attracted a total of more than fifty students and has a capacity for 120. Roughly speaking, the training begins with a one-year course at Schleizheim, only the advanced students being admitted to Braunschweig for the other three years in the normal course for pilots. A few students are graduated from the schools after one or two years, but these are only given sufficient technical training to



Practical navigation is an important part of the course

qualify them to serve in managerial and other ground-work tasks in the Luft Hansa system.

The others must pass through the full course on all types of planes before getting their diplomas. Although the total number of hours in the air is not greatly different from the time spent in learning to fly in America, the longer course is devoted as well to navigation and motor mechanics. The student is a finished aeronautical engineer, as well as a pilot, at the completion of the course. The average age of graduation is about the same as for many professional schools in America—approximately twenty-six years. From this one fact, it may be judged that aviation here is on a slightly higher plane than in America.

The flying school at Braunschweig is similar in plan to the projected U. S. Army Air Corps school in Texas. It includes several well-equipped landing fields, hangars, administration offices, machine shops, laboratories and dormitories. It is an entire community in itself, and a student could live within the confines of the airdrome for the duration of his course.

Modernity in scientific instruments and equipment of the dormitories are the keynotes in Braunschweig. In going over the place, I could not help comparing it with many of the dormitories in American colleges. Shower baths, comfortable rooms and spacious lounges are installed on each floor. The main difference was noticeable in the interior decorations, propellers and cylinders of engines being used for chandeliers.

Outside in the hangars are probably a hundred planes of different types, varying in size from the eighty-horsepower Siemens to the pterodactyllic Junkers F. 13. The pilots advance from the Flamingo training plane to the Albatros H, corresponding in size and speed to the Curtiss and DeHavilland and then progress to the eight and ten-passenger Junkers F.13, G.24 (tri-motor) and the Dornier-Mercur.

After guiding me through the school, an inspection requiring the better part of an hour, Herr Rostock, the supervisor, gave me a copy of the entrance requirements among other data pertaining to the students. It runs somewhat as follows:

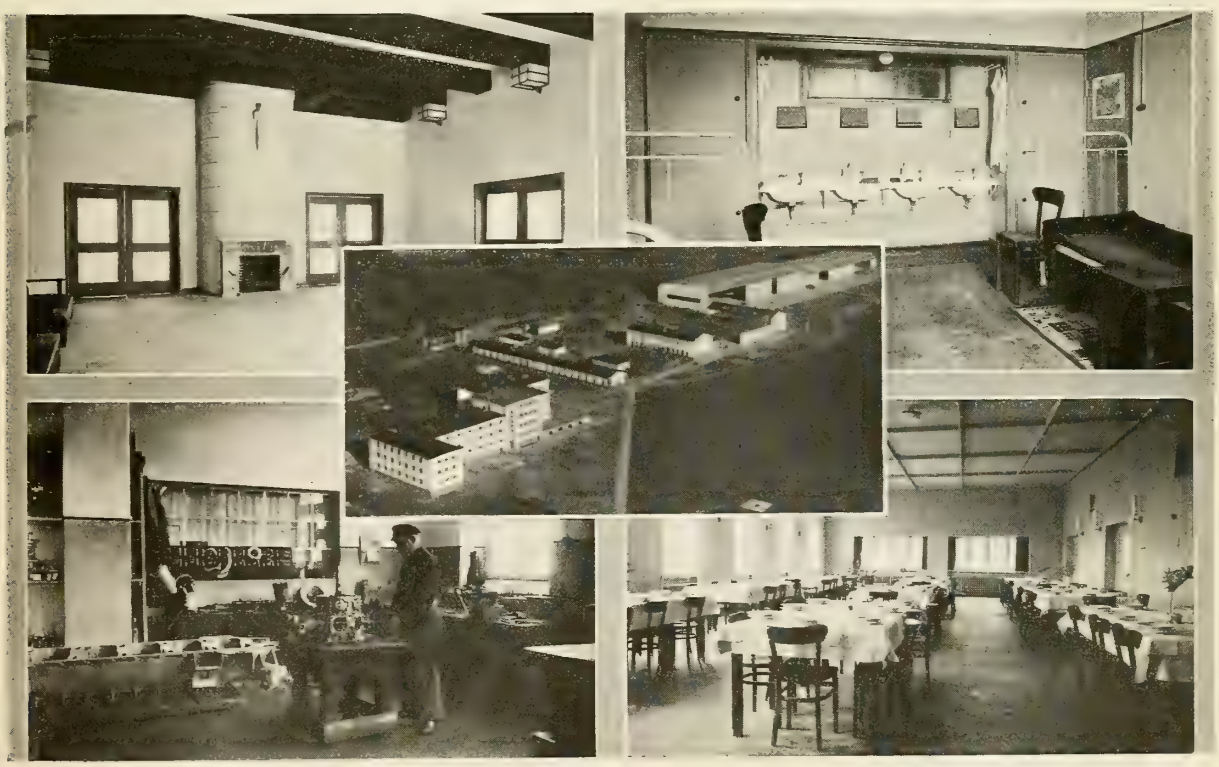
All applicants for training as passenger plane pilots having technical (middle-school) preparation must have had a year's previous instruction at the German pilots' school and must have been specially recommended as to their merits as fliers. They must also be between the ages of nineteen and twenty-three, the minimum period of training being two years.

Applicants without special technical training must be graduates of high schools and fulfill the other heretofore mentioned requirements. For these latter the training period is three years. Courses of a year also are given for ground engineers and non-licensed pilots. The average cost of the courses amounts to 140 marks ($35.00) a month.

All these courses, I later discovered, are conducted along such rigid lines that only about twenty per cent of the students who enter succeed in completing the course. This is not the result of accidents, for the percentage of fatalities among students is remarkably low.

The pilots thus trained in the courses at the four major flying schools are given ships in the Luft Hansa system that covers Germany like a cobweb. On most routes travel by air is as cheap as that on first class trains.

A glance at the air map of Germany affords numerous reasons for the astounding development of the air traffic schools—and "traffic" is about the best translation in this case of the word *Verkehr*. More than fifty airports over the length and breadth of (*Continued on page* 136)



Arising from the soil of German aeronautical history, Braunschweig is today one of finest aviation training centers in the world: (inset) An aerial view of the school; (upper left) one of the lounges and (right) student quarters in the dormitory; (lower left) the shop where engine technology is taught and (right) the dining room in the dormitory

ADEQUATE VISIBILITY FOR PLANES

By Dwight Huntington

ANYONE reasonably informed on aeronautical history can recollect several instances of airplane collisions that resulted disastrously, despite the very small number of ships in the air at those times. Pilots well-known for their experience, capabilities and conservatism have frequently figured in these collisions. With these facts in mind, together with the probability that we shall presently witness very rapid increases in the number of light planes—piloted by inexperienced and often careless pleasure seekers—the dangers due to inadequate visibility may be seen in their true magnitude. The problem falls within the scope of general safety considerations yet it is a subject deserving of individual treatment due to its many and varied ramifications.

It must be conceded that visibility from the pilots' seats of practically all ships that have been flown has been adequate so long as their pilots have been alert and on the job. The narrative of an air collision usually is the story of two pilots momentarily "caught napping." From the manufacturers' point of view therefore, the ships were all right and the pilots entirely to blame. But that brand of reasoning will not contribute in any way to light plane development. It merely permits of a slow progress, certain to be unpleasantly interrupted with ever-increasing frequency.

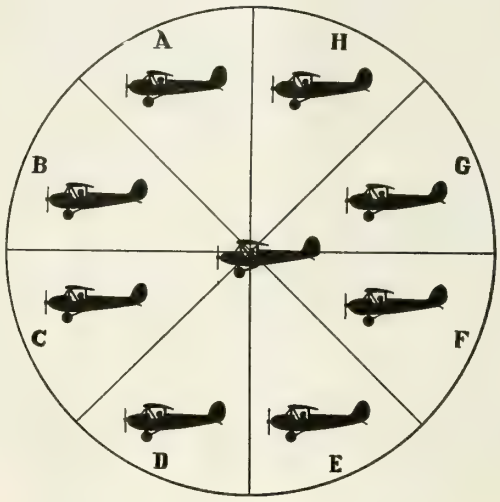


Diagram illustrating range of visibility.

Let us first of all renounce another theory, nursed by many, that all airplane collisions are the result of inadequate visibility in the participating planes. There are, in fact, three distinct possibilities in this connection. Two ships may meet within the ranges of vision of the two pilots, both temporarily distracted from their directions of travel. Or the pilot of the approaching plane may be "blinded" and the second pilot unobservant. In the third instance the two ships may collide within their respective blind angle ranges while their pilots are fully covering their individual flight paths, yet without thought of the possibilities of blind angle approaches.

The first type of accident can never be eliminated entirely. Even roller skates are "blind" to the user who prefers to look in a direction other than the one in which he is traveling. The best that the industry can do toward keeping down the number of accidents of this variety is to launch an educational campaign—and keep at it!

In all probability, however, the large majority of air collisions thus far fall within the two latter classifications. And if manufacturers are unwillng to assume responsibility for blind angle collisions of the past, they may begin now to do so, with profit to themselves. By means of the more effectual elimination of blind spots, the last named type of accident may be wholly prevented and the second species held down to an insignificant figure. The answer of course is to be found in more thoughtful design.

Two typical examples of blind angle collisions are illustrated in the accompanying figures, 1 and 2. Taking into consideration the many varied types of ships and the multiplicity of air maneuvers, together with important other variables such as relative speeds and directions of both planes and air currents, the large number of possible collision combinations, with present day planes, becomes apparent. Enterprising manufacturers will quickly sense the ruinous potentialities of dangerous combinations and remove every possible obstacle to good visibility in their products.

The dangers of collision due to inadequate visibility may be grouped, first, collisions with ground objects and second, with other aircraft. In the latter instance we may for convenience, sub-group according to responsibility. First, primary responsibility—the pilot maneuvers into another ship. Second, secondary responsibility—the pilot fails to notice the approach of the other ship.

The accompanying visibility diagram illustrates the pilot's theoretical sphere of vision. For convenient analysis this sphere has been first divided into fore and aft hemispheres each of which was then subdivided into four equal spherical sectors. The encircling ships may be assumed to occupy any positions within their respective sectors.

Since present planes cannot be thrown in reverse, a la humming bird, in fact cannot even tail-slide near the ground with impunity, we may make a general assumption that our pilot is primarily responsible for collisions occurring in the fore hemisphere and secondarily responsible for those in the aft hemisphere. This analysis, of course, disregards the instance of planes approaching from the opposite direction but the honors in cases of that sort may well be divided evenly.

The problem thus becomes one of ascertaining the preferred angles of vision and designing for them. For convenient selection the eight spherical sectors have been lettered, in alphabetical order and counter-clockwise direction, beginning in the upper sector of the fore hemisphere. In listing the sectors in order of importance, both primary and secondary responsibilities should be considered and the reasons for the particular choice fully stated. It may be observed that opposite sectors entail reversals of responsibility. For example:

1. Sector C. Primary; covers taxiing and taking off, slow speed flying, gliding and landing; including possible collision with ground obstructions. In conjunction with Sector B, C also covers cruising speed and the most important approaches from the opposite direction of flight.

Secondary; a sudden pull-up loop or climbing turn.

2. Sector B. Primary; covers high speed flying, climbing and zooming. Secondary; mushing, gliding, slipping, barreling and diving turns.

3. Sector D. Primary; covers diving and mushing. Secondary; zooming and looping.

4. Sector G. Secondary; covers a fast approach. Primary; a rapid pull up and a climbing turn.

5. Sector A. Secondary; covers gliding, mushing, diving turn and side-slip approaches. Primary; pull up for whip-stall or wing over, and straight zoom or loop.

6. Sector F. Secondary; covers a climbing approach. Primary; mushing, gliding, slipping, barreling and diving turn.

7. Sector E. Secondary; covers a sudden pull-up. Primary; gliding, mushing, slipping and diving turn.

8. Sector H. Secondary; covers a wiseacre's diving approach and possible squash. Primary; climbing and zooming.

The foregoing example is merely a designer's viewpoint, based on limited air experience and is merely offered as an inducement to pilots to assist the industry by drawing heavily upon their flying experiences. It will be observed that the whole study is a balance between trusting oneself or the other fellow, with No. 1 preferred as usual. In the final analysis it is the experienced pilots who, forgetting their customary reticence, should state emphatically where vision is most needed—and why. A mere tabulation of sectors in the order of preference will avail little. Aviation Underwriters may well assist by means of the compilation and general dissemination of the accurate facts on air collisions. By utilizing the great amount of practical experience that has been acquired and by means of careful analysis of previous accidents, designers should be enabled to devise quickly means of providing adequate visibility in their brain-children.

Probably the enthusiasm with which the average pilot undertakes his work encourages an attitude of tolerance toward numerous design shortcomings, such as restricted visibility, of which he may be fully aware. No doubt it was a representative of this large group who, on landing and being accosted by an inspector with a harsh "What's the idea of the stunting?" replied, "Stunting? Hell, I wasn't stunting—only trying to see the field as I came in for a landing!"

The fact that one can take as example a half-dozen varying—yet standard—commercial designs, and find that the wings blanket the pilot's vision in at least eighty per cent of the vertical plane range, is ample evidence that this problem has not been permitted to exert its rightful influence upon design. Certain it is that there can be but one best series of preferred angles of vision for all commercial planes and until this matter has been thoroughly studied and a general agreement reached by a large number of pilots, designers will continue to work at a disadvantage, which encourages indifference. No true conception of the dangers of inadequate visibility can be gained by peering across a drawing board, nor by occasional flights in a passenger's seat.

Sidewise vision in each spherical sector should be comparatively easy of attainment, excepting of course where broken by the wing panels. At least the light plane designer has no outboard engine nacelles to worry him. Where possible it should be ascertained whether vision is necessary in the entire sector or only in its central portion.

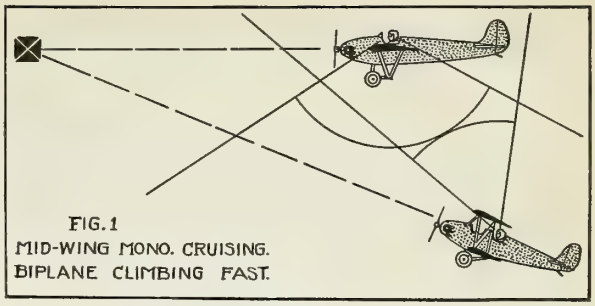


FIG. 1
MID-WING MONO. CRUISING.
BIPLANE CLIMBING FAST.

One logical approach to the visibility problem appears to exist in the tabulation of all sensible maneuvers to be designed for, relegating the others to positions of minor importance and educating pleasure fliers accordingly. In general, it appears probable that pilots are least observant at cruising speeds, but to pilots figuring in air collisions it usually matters little who was to blame. Insurance companies, however, may be very much interested.

A curious fact, worthy of the attention of plane designers, is that automobiles, which require visibility only in the lower fore quadrant, and straight aft, yet afford much better vision than many present day ships.

Undoubtedly the plane designer's first concern should be the fore hemisphere. Probably vision rearward, by means of one or two carefully placed mirrors, is next in importance, followed by a study of visibility during maneuvers.

Designers may profitably give more consideration to rear-vision mirrors, since it appears probable that, sooner or later, pilots—and particularly pleasure pilots—are going to rail at the discomforts of straining their necks unnecessarily. Rear view mirrors may well be of circular shape, the mirror surface being slightly convex to enlarge the cone of vision. The fact that light will strike and leave the mirrored surface at equal angles to the line of tangency is worthy of remembrance in locating the mirror with reference to the pilot's eye-line.

Another point is that blind spots should be broken up as much as possible. Several small ones are preferable to one large one since the pilot will have much less trouble in covering the former by maneuvering.

The light pleasure plane is not to be carelessly compared with the slow-maneuvering transport. It is more nearly comparable to the pursuit ship—yet pursuit pilots usually go out in search of trouble and are well trained to spot its approach. Consequently, we may conclude that the provision of "adequate" visibility should reach its highest points of attainment in light planes, whose owners will much prefer to take their recreation with the least possible mental annoyance.

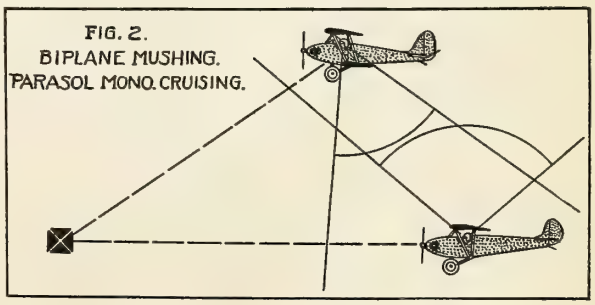


FIG. 2.
BIPLANE MUSHING.
PARASOL MONO. CRUISING.

THE COMPOSITE WING AIR FLOW

Article Twelve on the Principles of Aerodynamics

By

Dr. Max M. Munk

IN THIS article we discuss the combination of wing section flow with lateral downwash flow of a wing, for the purpose of obtaining the direct relations between the angle of attack, the lift, and the drag of any wing. These are the relations proposed by theory and applied with best results in aerodynamic practice.

Through a consideration of the lateral downwash flow by itself, merely by computing the energy of motion contained in it, we have already calculated the induced drag and the theoretical drag of the wing. Its magnitude was seen to be

$$D_i = \frac{L^2}{V^2\ \rho/2\ b^2\pi}$$

The induced drag is computed by dividing the square of the lift by the dynamic pressure and by four times the span circle. This derivation of the magnitude of the induced drag from energy considerations satisfies the practical needs perfectly, but it does not give the clearest possible insight into the mechanism of the creation of the induced drag. A much more vivid picture is obtained by the contemplation of the composite flow consisting of the pure wing section flow and the lateral downwash flow of the wing, both superposed and occurring simultaneously. The arguments based on this composition of flows give a new and additional result; they furnish the second principal relation of the wing theory—the relation between the lift and the actual angle of attack. There is, therefore, reason to pause in order to look at this composition of the two flows. Around the pictures and conceptions immediately to be proposed hinges the most vivid understanding of what occurs around the airplane wings. Nothing has been invented that satisfies in a better manner the natural curiosity concerning the effects that keep an airplane aloft. The discussion can moreover be restricted to the use of common engineering language, of quite elementary relations, and of the simplest high school mathematics. The intellectual pleasure to be derived is not spoiled by requiring too much intellectual effort.

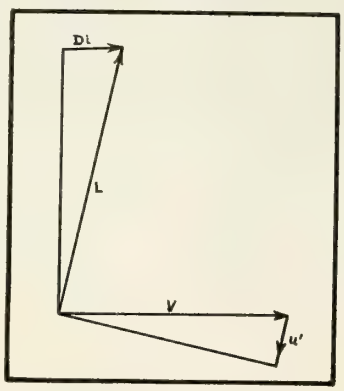


Diagram showing the creation of induced drag by the downwash

The pure wing section flow around the wing contours, occurring in vertical planes parallel to the direction of flight, must now be considered as a local air motion, subordinate to the lateral downwash motion in the vertical planes parallel to the span. This local wing section flow, and the magnitude and direction of its air force, is determined by the local motion of the air relative to the wing section—not by the relative motion of the entire bulk of air, or the undisturbed air far away from the wing. The wing section flow takes place in the immediate vicinity of the wing, and is, therefore, determined by the motion between the wing and the air in its immediate vicinity. The wing section flow is a local effect. The air strikes the wing with a local angle of attack and it flows in a path which is a local direction of flow. All these local quantities are not the same as the corresponding quantities conceived in the ordinary way from the motion of the airplane relative to the ground. The undisturbed air gives certain directions and angles of attack, but the wing is not supposed to fly in the undisturbed air—it flies in disturbed air. The wing is supposed to fly in air which executes the downwash flow. The air approaching the wing is gradually forced into the downwash motion, and when the air reaches the wing, it has already acquired a local downwash velocity, a portion of the final downwash velocity, and is no longer undisturbed.

The velocity of the air around the wing and relative to it is, therefore, the superposition of the horizontal velocity V, the velocity of flight, and of the vertical local downwash u'. The relative wind velocity is, therefore, not horizontal (although the airplane is supposed to fly horizontally) but the air flows gently down at the points of the wing. The small angle of this downwash inclination of the relative air stream is u'/V, the ratio of the vertical component divided by the horizontal component.

The existence of such slope of the wind direction has two important consequences. In the first place, the direction of the lift is determined by this inclined flow path rather than by the horizontal flow path of the undisturbed air. In the pure wing section flow, the lift is exactly at right angle to the relative motion. If the wing flies in a horizontal path of a pure wing flow, the lift is vertical. The lift is still at right angle to the relative path, but in spite of the horizontal motion of the airplane, this path is no longer horizontal, but is inclined. Hence the lift is no longer vertical, but also inclined. The downwash flow turns the relative motion, with which is turned the entire wing section flow, including the resultant air force, the lift. Relative to the relative motion, the theoretical resultant air force continues to be free from drag. The same condition, however, does not obtain in regard to the absolute motion of the wing. The lift being at right angle to the relative motion, it is no longer at right angle to the absolute motion. The resultant air force, therefore, possesses a component parallel to the absolute motion of the airplane. This component is the induced drag.

This picture of the wing, with its pure wing flow and resultant air force turned as a whole, is the idea about which modern wing theory centers. The wing is flying in falling air, falling under the gravity action of the airplane itself. The airplane, while actually and obviously flying at an exact level, is nevertheless climbing continuously in order to overcome the effect of the falling air and avoid falling with it. That means consuming energy, just as a man needs to expend energy when walking in soft sand, where

he sinks down with each step, and has to climb up again to the old level from the lower level of the impressions made by his feet. An automobile furnishes us a similar comparison when driven through soft sand, and here the analogy is even better because the motion of a wheel is continuous. The automobile reacts as if it were being driven up a hill, though the force between tire and ground is not vertical but inclined. Thus also is inclined the lift of the airplane flying in air pushed down by itself. The air force tends to slow down the motion of the airplane, thereby manifesting the induced drag.

The geometric picture of the air motion leads to the magnitude of the induced drag in a most elementary way. The triangle of the motions, containing V and u', is similar to the triangle of the forces, containing L and D_1, because all three angles of one triangle are equal to the three corresponding angles of the other triangle. Hence $D_1 L = u'/V$, or $D_1 = L\ u'/V$. In the preceding article of this series we dealt with an expression for this induced drag computed from the energy of the lateral flow. We found that

$$D_1 = \frac{L^2}{V^2\ \rho/2\ b^2\pi} \quad \text{and since} \quad u = \frac{L}{V\rho\ b^2\ \pi/4}$$

we have $D_1 = \frac{1}{2}\ \frac{L\ u}{V}$. The comparison of this relation with the relation $D_1 = \frac{L\ u'}{V}$ obtained from the picture of the flow itself shows $u' = \frac{1}{2}\ u$. The local downwash at the points of the wing is exactly half of the final downwash. The downwash factor of the local downwash is $\frac{1}{2}$. This results not from guess or assumption, but from computation. However plausible the value $\frac{1}{2}$ may appear, this value is used not on its own merit, but because every other value would lead to contradictions. Theory indicates that at the points of the wing, the surrounding air must be assumed to possess the local downwash velocity

$$u' = \frac{L}{V\ \rho/2\ b^2\pi}$$

and is, therefore, flowing under the inclination

$$\frac{L}{V^2\ \rho/2\ b^2\pi}$$

relative to the actual flight path.

This inclination between the relative flight path and the actual flight path explains not only the induced drag, but also has another important effect. The wing section flow has turned, but the section itself has not turned. Its angle of attack relative to the surrounding air is therefore changed. It is obviously diminished by the downwash angle and cannot, therefore, produce the same wing section flow as in absence of the downwash. The wing section flow is not only turned, but it is also changed to correspond to a smaller angle of attack. The angle of attack in the pure wing section flow, the local angle of attack (called, in this connection, the effective angle of attack) αe, is no longer identical with the actual angle of attack between the wing and the actual flight path, called the geometric angle of attack αg in order to distinguish it from the effective angle. The latter is smaller, and the difference between the two is the downwash angle, (now called induced angle of attack) αi. Written in the form of an equation

$$\alpha e = \alpha g - \alpha i$$

When the wing is turning down, the air flow turns down with it, diminishing the geometric angle of attack by the induced angle of attack so that their difference only remains effective for the deflection of air and the creation of lift.

Both angles, the effective angle of attack and the induced angle of attack, have already been expressed by means of the lift and of the other quantities, thus:

$$\alpha ea = \frac{L}{V^2\ \rho/2\ 2\pi S}$$

$$\alpha i = \frac{L}{V^2\ \rho/2\ b^2\pi}$$

Both are proportional to the lift and inverse to the dynamic pressure. It follows that the modification of the magnitude of the lift by the downwash does not change the type of the lift curve, of the lift plotted against the angle of attack. The line remains straight, whether referring to the pure wing section flow or to the actual wing air flow. The downwash flow, however, diminishes the slope of the lift curve. Eliminating from the three preceding equations the induced angle of attack and the effective angle of attack gives

$$\alpha ga = \frac{L}{V^2\ \rho/2\ 2\pi S}\left(1 + 2\ \frac{S}{b^2}\right)$$

or, slightly transformed

$$L = \frac{2\pi S\ \alpha ga\ V^2\ \rho/2}{1 + 2\ s/b^2}$$

The corresponding equation for the pure wing section flow is

$$L = 2\pi S\ \alpha ga\ V^2\ \rho/2$$

which results also if in the general equation S/b^2 is put at zero.

The comparison of the two equations shows that the downwash flow diminishes the lift which would have been obtained without it. The lift is diminished in the ratio

$$\frac{1}{1 + 2\ S/b^2}.$$

The deflecting capacity of the wing, exemplified by its area and inclination, does not come to its full development —it is not fully sustained by the lateral wing extension. The lift-sustaining efficiency is smaller than *one;* it is only

$$\frac{1}{1 + 2\ S/b^2}.$$

We combine the two main relations furnished by the wing theory. The induced drag is

$$Di = \frac{L^2}{V^2\ \rho/2\ b^2\pi}$$

The lift is

$$L = \frac{(\alpha + \alpha o)\ 2\pi S\ V^2\ \rho/2}{1 + 2\ S/b^2}$$

where α denotes the actual conventional angle of attack of the chord (in radians), and ao, the angle between the conventional chord and the average direction of the mean

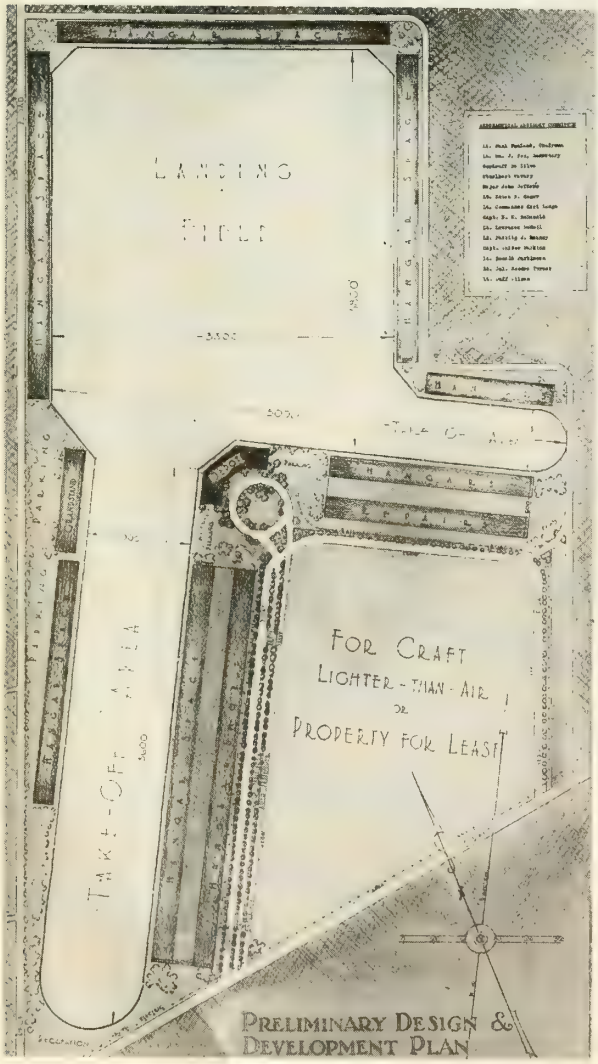
(*Continued on page* 81)

LOS ANGELES COUNTY AIRPORT PLAN

By Clancey Dayhoff

ABOUT three years ago, members of the Los Angeles County Regional Planning Commission were meeting in informal session at the regular monthly conference. Discussions had varied from the plotting of highways throughout the County to the wholesome regulation of land subdivision.

For five years the Planning Commission had been in existence as an effective branch of the Board of Supervisors, its work consisting of making Los Angeles County a county beautiful. Designs were in the blueprint stage for a practical, comprehensive, and consistent plan of modern highway development. In devising these arteries of automobile transportation which would meet the requirements of the present and future population, the Commission had encountered trying obstacles. For example, the Commission could only suggest; it was without executive power. Also,



Proposed Los Angeles County Airport near El Monte

the members had been faced with the task of accomplishing twenty-five years work in five. It was a heart-breaking task but the final results were worthy of the effort.

The talk around the table veered suddenly. It turned from automobiles to airplanes. The fruits of a flight from New York to Paris, made during that year by a tousled-haired young man, were apparent throughout the United States. Especially was this public interest in aviation evident in Southern California. Here was a year-round paradisical climate. The air above Los Angeles even then was daily stirred by the swish of airplane propellers.

One man in the group around the table arose suddenly and spoke:

"Gentlemen, aviation is almost here as a commercial industry. Western Air Express already has the contract for carrying United States air mail from here to Salt Lake City from where it continues to Chicago and New York City. At the insistence of the public, they have recently added passenger accommodations. Millions are being spent today in widening and straightening streets to care for the unforeseen volume of traffic which followed the development of the automobile. If we repeat this error in our provision for the airplane, we shall be more severely criticized than our predecessors, for this time we are more fully warned of the possibilities involved.

"The latest figures indicate that there are more airplanes in civilian operation in the United States today than there were automobiles in 1900. We have no means to measure accurately the future extent of aviation, but we have enough data to enable us to make a fair estimate of the provisions that ought to be made for it in Los Angeles County. The present total of heavier-than-air ships in the County is 430, or one plane for every 5,000 persons. Indications are that by 1960 this ratio will be reduced to 500 persons per plane, which would mean the existence of 14,600 airplanes in this County at that time. It may be further estimated that 130 years from now, the number of airplanes will be such that there will be one for every 100 persons.

"Gentlemen, which shall it be, plan or patchwork?"

There was silence in the room for a moment as each member of the staff turned the matter over in his mind. Then someone framed a motion and it was carried unanimously. Airport development in Los Angeles County would be by plan.

This resolution in itself was relatively unimportant. The same procedure with a few ramifications was no doubt carried out in hundreds of American cities and communities during the peak of aviation development in the years of 1927, 1928 and 1929. But what is *really* significant is that a comprehensive plan is being carried out in Los Angeles County.

Let us see what the Commission has done. There are 4,000 square miles embraced within the boundaries of Los Angeles County. This territory is nearly equal to the size of the state of Connecticut. Now, three years after that memorable meeting of 1926, there are forty-six airports in active operation with airplanes landing and taking off every day. There are eighteen other airports which have been

used as landing fields and can be again on a moment's notice, but which are temporarily inactive. Sites of the airports range from the seacoast to the mountains and to the desert or arid country beyond.

The San Gabriel Valley lies between the County's center of population and the two great mountain passes to the East, and will be the pathway of an ever-increasing transcontinental air traffic. The airplanes of Transcontinental & Western Air and of Western Air Express now follow the Valley in flying to New York and Salt Lake City, as do the passenger and mail planes of the American Airways. The foregoing data were taken into consideration when it was desired to develop a regional plan of airports, coordinating, not only with each other, but with the highway network of the County. In view of the fact that the Commission did not have a personnel technically trained or experienced in the matter of airport selection, and further that the expense would make it impossible for the Commission to employ sufficient skilled personnel, in 1928 a committee was formed composed of experienced fliers from the various air transport companies, the War Department, the Navy Department, and the Department of Commerce, as well as civilian fliers.

This committee was composed of Lt. Paul Penland, Lt. William J. Fox, Woodruff de Silva, Ethelbert Favary, Major John Jeffers, Lt. Eston B. Koger, Lt. Commander Karl Lange, Capt. E. E. McDaneld, Lt. Lawrence McNeil, Lt. Phillip J. Meaney, Capt. Walter Parkins, Lt. Donald Parkinson, Lt. Col Roscoe Turner and Lt. Duff Wilson. After a preliminary conference it was agreed between the committee and the Commission that the 4,000 square miles of the County should be divided in regard to the topography, soil, accessibility, obstructions and ownership. The limitations placed on working-drawings by considerations of size and scale led to the decision to divide the County more or less arbitrarily into districts, keeping as nearly as possible to the following natural geographic divisions:

1. San Gabriel Valley.
2. La Crescenta Valley.
3. San Fernando Valley.
4. Antelope Valley.
5. San Gabriel Valley Range.
6. Los Angeles Harbor District.
7. Pacific Coast Beach District.

Each section has its distinct problems, but all are inseparably bound together by common interests. It was decided to attack the airport development work according to the divisions and in the order named.

Then in cooperation with the Regional Planning Commission, this committee went into the field and reviewed all open flat spaces in the San Gabriel Valley. These spaces were given a rating, based on physical features involved and requirements for a system or airports and landing fields. A group of fields was selected temporarily to provide for the ultimate development of aircraft in the San Gabriel Valley. The accompanying map shows the plan finally arrived at by the Commission, working in cooperation with this committee. It also shows the location of existing airports and landing fields in the San Gabriel Valley.

Mr. Bryant Hall, research engineer of the Regional Planning Commission, explains the object of the Commission:

"We endeavor to suggest for each community the location of a sufficiently large airport for local use, and to indicate one centrally located major air terminus sufficiently large and well-equipped to serve as a focus for all the flying activities of the Valley. This field will serve the needs of heavy transport ships, mail planes, and long distance passenger planes. The other airports proposed are so spaced as to provide for the various local lines, private ships and service planes, and also to serve as emergency landing fields. Together they constitute a coordinated system of airways which would, if set aside now, provide adequate ground facilities for aviation in the years to come. We have tried to point out to municipalities desiring to prepare themselves for the future that the wise policy is to secure the necessary ground immediately, using it for agricultural purposes, playgrounds or parks until needed for the operation of aircraft.

"As the population increases the need for supplementary landing fields will follow in direct ratio. Highways will be choked with trucks and pleasure automobiles. Traveling, say, from the Eastern boundary of the County to the Western by surface transportation will probably require several hours. By airplane the trip can be made in a few minutes. We expect that taxi planes will operate from the supplementary airports to the major air terminals and also to the other supplementary airports. A business man will be able to step from his door, walk two or three blocks to the local airport and either make connections with the large transport planes operating from the centrally located air terminals in his district or take a taxi plane to the small airport several miles away near his place of business. The probability of such a transport system is strengthened by the general movement of city-employed persons to the suburbs, where they can live without disturbances. Such a movement is encouraged in Los Angeles County where there are hundreds of square miles for such expansion."

The ultimate airplane density of the San Gabriel Valley as predicted by the Regional Planning Commission and the anticipated number of airplanes, totaling 13,920, is shown in the following table:

City	Area (Square Miles)	Ultimate Population	No. of Airplanes'
Alhambra	6.20	100,000	1,000
Arcadia	9.70	150,000	1,500
Azusa	4.06	74,000	740
Claremont	3.33	25,000	250
Covina	0.86	13,800	138
El Monte	1.14	18,200	182
Glendora	2.18	35,000	350
Monrovia	7.91	80,000	800
Monterey Park	5.00	70,000	700
Pasadena	17.70	300,000	3,000
Pomona	12.50	200,000	2,000
San Marino	3.50	35,000	350
San Gabriel	3.00	48,000	480
Sierra Madre	2.94	47,000	470
South Pasadena	3.14	50,000	500
West Covina	8.00	128,000	1,280
La Verne	1.25	18,000	180

With the beginning of work on the airport plan, engineers of the Regional Planning Commission decided that all conclusions should be based upon thorough fact-finding surveys made in logical succession. William J. Fox, chief engineer of the Commission, directly under Charles H. Diggs, director, and Mr. Hall came to the conclusion before they had gone very far into the matter that one of the most important points to consider was present and future

population density, since this factor determines largely the transport services required.

"We believe and still believe that the foremost consideration in the planning of airports, as in designing a highway system or water system, is the correct estimate of population density, present and future. Without such an estimate, airport operators could neither arrange for needed extensions nor calculate the earning power upon which their financial structure depends. With this information, money is expended where it will do the most good, and equipment can be located to the best advantage. There are five factors involved in determing the area of paved highways needed for safe and efficient movement of motor vehicles in a given community, three of which also pertain to the location of airports. They are:

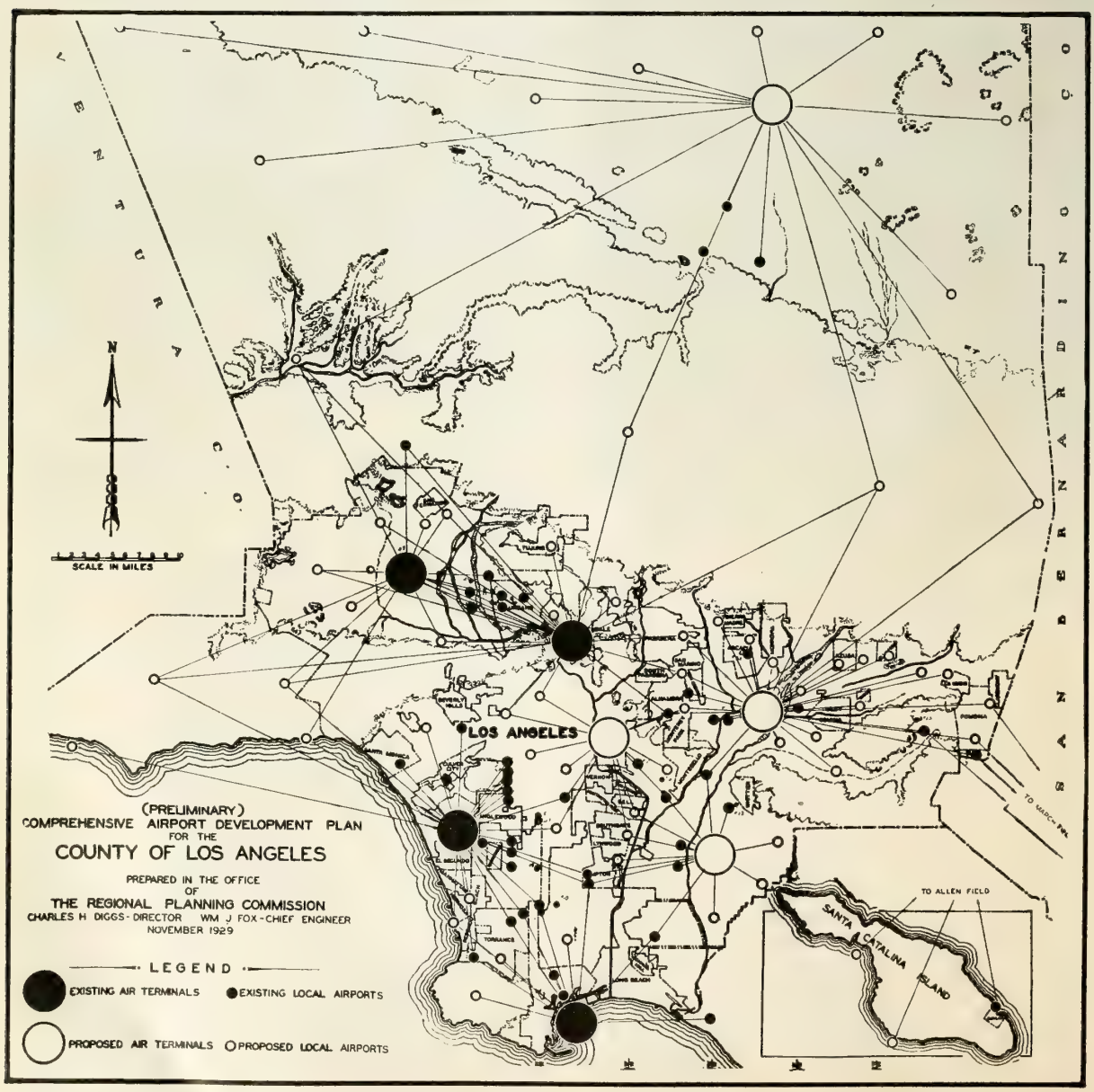
"1. Area of the district to be served.

"2. The percentages of the area which are to be devoted to the several types of use.

"3. The ratio of population density to area resulting from these various types of uses.

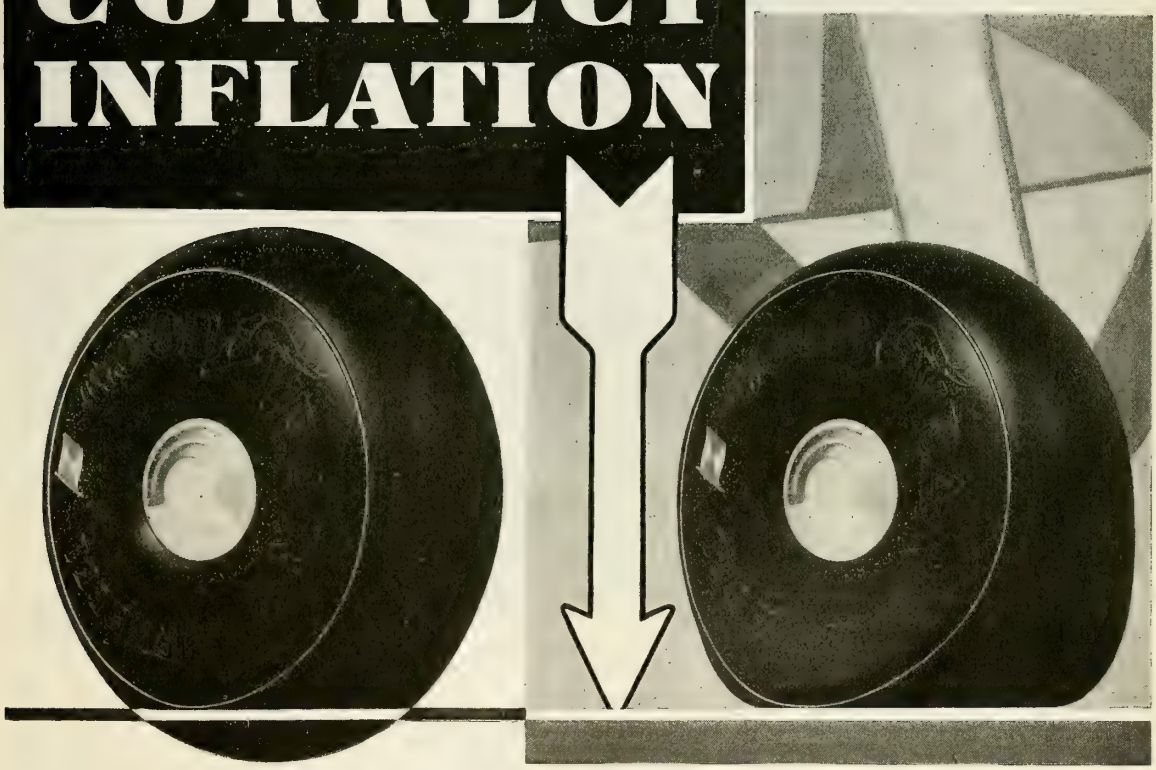
"In planning airports in regard to population density, it is first to be noted that there are certain areas, which by their very nature are not fit or intended to support a residential population. Two types of 'open' areas will be found: the mountainous or very hilly lands, forest reserves, river bottoms or washes, swamps and the like; and parks, golf courses, cemeteries, playgrounds and large public building sites.

(*Continued on page* 140)



Airport development plan of Los Angeles County. The airport at the top is the major air terminal proposed in the arid region north of San Gabriel Mountains which is free from inclement weather the year round.

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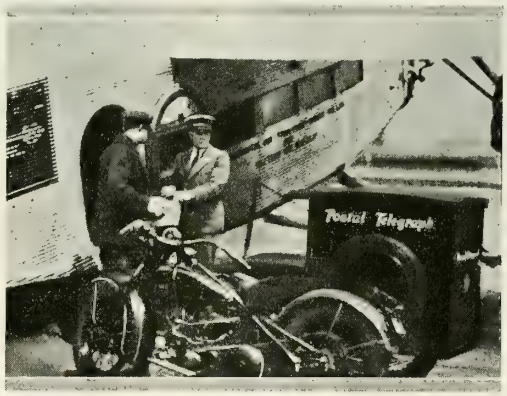
MERCHANDISING AIR TRANSPORT

By T. Park Hay
Transcontinental & Western Air, Inc.

EVERY operator in the business of air transport has heard the often-repeated criticism that the airlines have been keeping their service too much a secret from the traveling public. While the charge is not wholly justified, it must be admitted that in the past facilities for obtaining information regarding air travel, for procuring tickets and arranging express shipments have been limited. Many an air journey or shipment has been abandoned because the prospective customer did not know where to go to make the necessary arrangements.

While many improvements in the matter of merchandising their services were made by the airlines during the past year, they were still far from a satisfactory system until the recent deals with the Postal Telegraph Company were made. Arrangements are now in effect whereby the telegraph company is handling both air passenger reservations and air express shipments from coast to coast.

The first company to contract with Postal Telegraph was Transcontinental and Western Air, Inc., and in less than a week the following lines, which represent more than sixty percent of the daily flying mileage of the country, signed up with the company for the sale of passenger tickets: American Airways, Inc.; Clarksburg Airways, Inc.; Eastern Air Transport, Inc.; Braniff Airways, Inc.; Gorst Air Transport, Inc.; Midcontinent Air Express; National Park Airways, Inc.; Northwest Airways, Inc., and Western Air Express, Inc.



The newest link between plane and patron

It is believed that the telegraph company tie-up has solved the problem of air transport merchandising. Postal Telegraph has daily contact with millions of people and it offers decided advantages in the location of its offices on busy corners and in big hotels—exactly where airlines were in need of offices.

The Postal Telegraph is giving efficient cooperation to the aviation industry. Throughout the country its offices display a large window easel which graphically describes the air passenger reservations and air express services. An air ticket exchange order has been designed and is available now at all Postal Telegraph offices. This order, exactly the size of a dollar bill, is honored by all the airlines which have arrangements with this particular telegraph company and is immediately exchanged for a ticket. The patron is advised on this order what seat he has in the plane, the hours of the flight, the date and other necessary data.

The company is also helping the aviation industry through a campaign to educate the public to the use of air transport by pasting on all telegrams stickers advising the public with regard to air express and passenger services. Pamphlets have been printed to promote the idea of air shipping and air travel.

Not long ago the company arranged an exclusive aviation program which was broadcast over station WABC, New York. Charles Sherman "Casey" Jones, the guest speaker, explained that the telephone on the prospective customer's desk is his air ticket office, since all he need to do to obtain passage on an airliner is to ask the operator for Postal Telegraph.

For various reasons one of the most important developments in commercial aviation has been the last to receive serious attention—that is, air express. This delay was due in part to the fact that airplanes at first were small and could not carry sufficient payload. But the chief deterrent has been the matter of pick-up and delivery service. Shippers could not be expected to bring their packages out to the airport and their customers on the other end to pick them up from the airport. It was necessary to find a connecting link between the plane and the patron and, as with the ticket offices, the operators were working on the problem of establishing branch express offices. It was realized that the successful operation of air express requires receiving stations over a city where shippers may deposit packages and know that they will be speedily delivered to the next outgoing airliner. Postal Telegraph's facilities, it was found, exactly fulfill the requirements, furnishing not only the receiving offices, but messenger service as well.

Transcontinental & Western Air, Inc., which has been studying air shipping possibilities in all sections of the country and pioneering air express for some time, was the first company to contract with the company for handling of pick-up and delivery of air parcels. The contract was arranged on May 1, 1931 at the same time that its twenty-four hour coast-to-coast service was started.

Details of the service have been carefully worked out. Two days before the service started the telegraph company's general manager sent a telegram to hundreds of shippers announcing the service and calling attention to the fact that messengers will call at home or office at any time of day or night to collect a shipment. Proper waybill receipts are given by the messenger at the time of pick-up. At all points on the line, messengers meet incoming planes and rush packages immediately to the consignee. Under this arrangement, express can leave Newark Airport, New York, as late as 11:45 in the morning and be delivered the same day in Harrisburg, Pittsburgh, Columbus, Fort Wayne, Chicago, Indianapolis, St. Louis, or Kansas City. Next morning, deliveries can be made in Albuquerque, Wichita or Los Angeles and by noon in San Francisco.

With the service definitely (*Continued on page* 144)

TEXACO AIRPLANE OILS . . .

Modern concrete and steel building housing classrooms, shops and equipment of Roosevelt Aviation School, Inc., Mineola, N. Y.



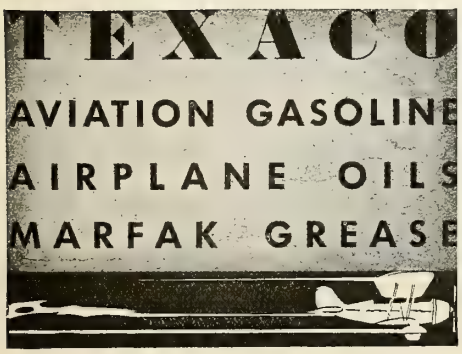
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● Texaco Airplane Oils in four grades to suit every engine condition, with Texaco Aviation Gasoline and Texaco Marfak Grease, the unusual rocker-arm lubricant, are available at the principal airports of the country.

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BIRMINGHAM MUNICIPAL AIRPORT

By Jack C. York

THE dedication of the Birmingham municipal airport, scheduled to be observed with a three-day ceremony May 30 to June 1, climaxes months of effort. The acquisition of this $1,000,000 airport, pronounced by many the finest in the South, involved not only careful work in the matter of construction, but also tireless effort in publicizing the idea.

Before the city could be sold on the idea, it was necessary to convince citizens that there was a real need for a field. Previously, Birmingham had been served by an eighty-three acre military field. As the first step toward the new field, an expert survey of the situation was made by Birmingham aviation men who had already won the confidence of the people. Their survey showed that the military field was beset with dangerous fog conditions, that obstructions which could not be removed offered great hazards at all times, that the field could not be obtained for a nominal price and that, even if it could, it would not be desirable.

A neatly bound copy of this survey was mailed to every influential man in the city. The facts were printed in all newspapers and preached by a special committee of speakers to every civic luncheon and service club in the city. The results from this educational campaign were soon soon apparent, and when a committee approached the city commission, favorable action was taken.

In preparation for a bond issue to finance an airport, a committee composed of the city engineer, an assistant city attorney who was a wartime flier, and the Commander of the National Guard Squadron set out to survey possible tracts of land that might be suitable for an airport. A number of pieces of acreage were selected. They were then submitted to a government airport specialist, who aided the committee in making the selection.

Estimates were made on the cost of the land, grading, drainage and other improvements and all figures were made public. A date for the bond issue was announced and for a month prior to that date, a special speaking committee visited every gathering where they could gain audience, urging a favorable vote. The bonds were adopted by a margin of two and one-half to one and $1,000,000 becomes available for building the municipal airport.

The new airport, which covers 315 acres is four and a quarter miles from the Post Office, a fifteen-minute drive on a paved highway. It lies in the northeastern section of the city. The site has been proved by tests conducted over a long period of time to be comparatively free from smoke, fog and similar atmospheric disadvantages. It is an all-way field, with one runway at present running north and south at a slight angle. The runway will be paved with asphalt and the remainder of the entire field will be sodded. The field is three-fourths of a mile east and west, three-fourths of a mile north and south and one and one-fourth northeast by southwest.

The airport is being made eligible for an A-1-A rating of the Department of Commerce. It is equipped with a meteorological radio station, teletype, and radio range beacons and is thoroughly lighted for night flying. Birmingham is on the southern transcontinental airway; the initial landing of the Southern Division of American Airways was scheduled to be made on the first day of the dedication.

The terminal building is of Southern Colonial architecture and is similar to the well-known Mount Vernon structure. Construction is fireproof. The exterior is painted white; the roof, slate.

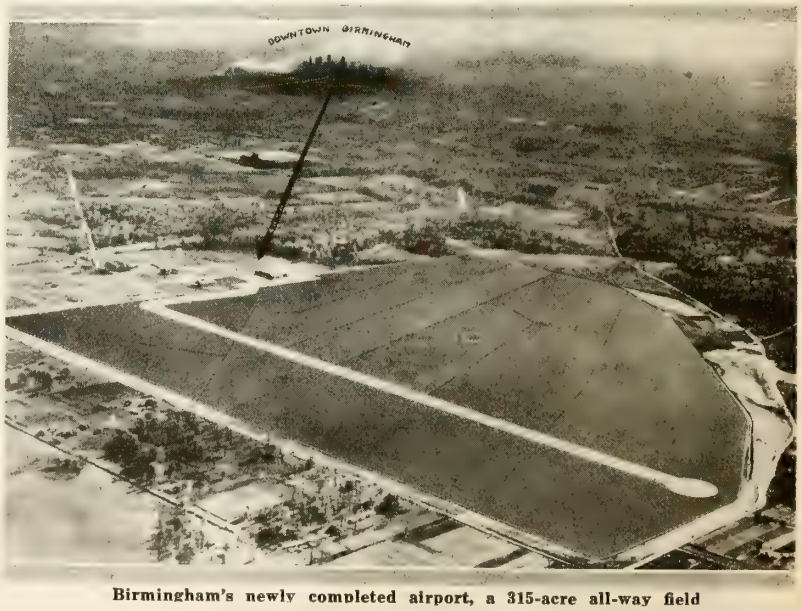
On the first floor is located a comfortable waiting room, flanked by the ticket office, telegraph office, baggage and check room, ladies parlor, concession shops and administration office. The east wing is occupied by the dining room. There is also a coffee shop, designed primarily for use of employees of the Air Park. The west wing contains space for the U. S. Post Office and houses a well-equipped hospital and first-aid room. The manager's office, men's parlor and two private offices are also on the first floor.

The second floor has been given over to eight offices, five bedrooms and lounges for both men and women pilots. Each lounge has a dressing room, shower and other toilet facilities adjoining. There will also be U. S. Weather Bureau, U. S. Department of Commerce and operators' offices on that floor.

An interesting feature is the tiled roof terraces over the two wings, which may be used by the public for observation. One of the terraces will be connected to the kitchen in the basement for dining or refreshment service. The cupola serves as a central observation tower in which are located the controls for all the field lighting equipment. It is possible, also, to control all the field lights from the manager's office and from a point in the hangar.

The hangar is a brick and steel structure, like the terminal building, and is painted white. The airplane storage room, or what is called the hangar proper, is 120 feet wide in one clear span and approximately 150 feet long. This space houses comfortably twenty-five or thirty average-sized airplanes. The south lean-to of the building houses the repair shop, boiler room and locker rooms and the north lean-to, which faces the field, will be occupied by the field garage, oil and pump room and several offices. The four second-floor rooms on the corner will be used as offices, dormitories, etc.

(*Continued on page* 124)



Birmingham's newly completed airport, a 315-acre all-way field

BEAUTIFUL, SAFE, COMFORTABLE

SPEED WITH EASE FOR FOUR

CURTISS-WRIGHT

SEDAN



To the sportsman, business executive and light transport operator alike, Curtiss-Wright offers the 4-place SEDAN, a distinctly new conception in light cabin planes. ● The beauty of its lines and the pleasing effect of harmonious colors make an immediate appeal to the man who takes pride in the possession of any fine article. ● And this first impression is heightened by a glimpse of the cabin interior. Rich in its appointments, luxuriously upholstered with fine fabrics and deeply cushioned seats, the spacious cabin of the SEDAN invites you through a generously wide door to the comfortable relaxation of many a pleasurable jaunt cross-country . . . . anywhere, anytime. ● Vision, that most important factor in safe, carefree flights, has been given special consideration. On the ground or in the air, the pilot looks out over a smoothly cowled engine which permits the same clear view one finds in a good motor car. Wide, adjustable side windows complete the fine range of vision, since they are unobstructed by the customary outrigger struts. ● And you will delight in the surprising performance of the SEDAN. Clean-cut lines and a new design wing curve, coupled with rugged, dependable power, assure the utmost in performance . . . . take off quickly, climb thousands of feet in a few short minutes, speed at two miles a minute and better if you like, then swing back to earth for an easy, slow landing . . . and thru it all the almost effortless control which comes with perfect balance and ballbearing controls. ● Know the real joy of flying. See your Curtiss-Wright dealer and arrange for a demonstration in the SEDAN. ● OTHER CURTISS-WRIGHT MODELS . . . . 2-pl. Junior . . . . 2-pl. Sport Trainer . . . . 3-pl. Sportsman deluxe . . . . 2-pl. Coupe . . . . 6-pl. Travel Air . . . . 8-pl. Kingbird.

CURTISS-WRIGHT

AIRPLANE COMPANY

ROBERTSON, MISSOURI

(A DIVISION OF CURTISS-WRIGHT CORPORATION)

CURRENT AIRPORT AND AIRWAY FACTS

Four New American Airways Services Extend System to 30,000 Miles

THREE new services have been inaugurated by the American Airways, Inc., and a fourth was scheduled to begin on June 1. New ten-passenger multi-motored planes, operating on faster schedules, have been put into service between St. Louis, Springfield and Chicago; passenger service has been inaugurated over the St. Louis-Kansas City-St. Joseph-Omaha air mail line; and a new service has been established between Cincinnati, Nashville and Atlanta.

Announcement has been made by W. Irving Glover, Assistant Postmaster General, that air mail service to be operated by American Airways will be established on June 1 over the route from Kansas City, Missouri, to Denver, Colorado. The service is an extension of the Evansville-Omaha route operated by this company. The service will be a daily one and will involve a round trip with a schedule arranged to the best advantage for both air mail and passengers.

Considerable importance is attached to the new Cincinnati-Atlanta service because of excellent air mail and air passenger connections to Florida, Cuba, the West Indies and South American countries and to southern and southwestern cities in the United States and Mexico. Real advantages are also offered in the schedule, the flying time being four and one-half hours between the two points as opposed to approximately thirteen hours on the fastest scheduled passenger train. Intermediate stops will be made at Louisville, Nashville and Chattanooga, Tenn.

With the newly inaugurated services the planes of the American Airways system are flying approximately 30,000 miles daily, making American Airways the world's most extensive airline system. The system serves approximately one-half of all the cities in the United States having air mail service.

P. A. T. Reduces Fare and Opens Service Between San Diego and Seattle

A DAYLIGHT trimotored passenger service from San Diego to Seattle by Pacific Air Transport, division of United Air Lines, was scheduled to go into operation on May 28. Elapsed time for the trimotors on the 1,206-mile flight is eleven hours and twenty minutes.

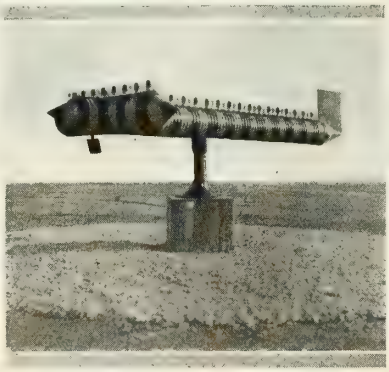
The schedule is arranged so that passengers leaving either Seattle, San Diego or Los Angeles in the morning may have dinner at the opposite terminal, the same evening. This is the first trimotored passenger service over the full route.

A twenty per cent reduction in passenger fares has been announced over the line, making the fare seven cents an air mile instead of eight and three-tenths cents. Fares include meals and cab transportation. There is a five per cent reduction on round trip tickets between most points.

Investment of $300,000 for new trimotored passenger planes, new hangar-depot construction at western cities, signing of a contract with Western Union to sell tickets, and the reductions in fares evidence the plan of United Air Lines to seek additional revenue in the air passenger field.

Pyle-National Company Announces New Illuminated Wind Indicator

THE Pyle-National Company has developed an illuminated wind T that gives pilots at a glance accurate information on both wind direction and velocity. Extreme sensitivity and visibility of the indicator from all angles has been secured by specially designed contour through which a maximum apparent area is obtained. Visibility by night is secured by means of closely mounted, vaporproof fixtures with alternate green and amber lamps set in the upper surface of the T.



Pyle-National Illuminated Wind T

Wind velocity is shown by a positive-acting electrical device, actuated by a pendulum-like flapper suspended beneath the body. As the wind velocity increases or decreases, the flapper actuates electrical contacts which alter the color combination of light displayed.

The body of the indicator is of sheet steel, corrugated to give a maximum resistance to lateral stresses. All bracing is done internally so that the indicator presents a clean surface to the wind. The T is accurately balanced and rotates on a double set of ball bearings.

The electrical equipment which forms a most important part in the operation of the T is designed and built by the Pyle-National Company. The vaporproof fittings are of extremely rugged design and give positive protection against the admission of dust and moisture. Fifty-eight vaporproof lamps carried on four fused circuits outline the T. The fuses and electrical relays are all located in the front nose of the body.

Midland Air Express to Open Fast Services Out of Kansas City

SCHEDULES calling for average speeds of 150 miles per hour will be maintained by the Midland Air Express, Inc., of Kansas City on its services scheduled to go into operation on June 1. According to the Detroit Aircraft Company, with whom the new company has contracted for ships, the line will operate between Kansas City-Sioux Falls, S. D., and Kansas City-Cheyenne, Wyoming.

Two Lockheed seven-place Vega monoplanes will make the run of 595 miles between Cheyenne and Kansas City in four hours elapsed time.

New York and Western Airlines Begin Fast Passenger Service

THE inauguration of fast, frequent schedules between Pittsburgh and New York and Pittsburgh and Buffalo on the New York and Western Airlines, Inc., brings New York passengers to Pittsburgh in two hours and fifteen minutes and to Chicago in six hours. The service went into operation on May 1.

Flying fast Lockheed seven-place cabin monoplanes, the new line is operating four ships each way between New York and Pittsburgh, with stops at Camden, New Jersey, and York, Pennsylvania.

T. & W. A. Opens Eight-Hour Service Between New York and Chicago

A NEW eight-hour all-air passenger and express service between New York and Chicago was inaugurated May 1 by Transcontinental and Western Air, Inc. Planes leave Chicago daily at 12:20 p. m. (Central time) and arrive at Newark airport at 8:44 p. m. West-bound planes leave Newark airport daily at 10:45 a. m. (Eastern Standard time) and arrive in Chicago at 5:55 p. m. (Central Standard time). Stops will be at Philadelphia, Harrisburg, Pittsburgh, Columbus and Fort Wayne.

Airlines Report Steady Increase in Volume of Traffic

BUSINESS is steadily improving for air transport operators, reports of a number of airlines show. For the third time in 1931 all previous records for air mail volume over the Eastern Air Transport system were broken in March when 87,227 pounds of mail were carried. This exceeds the February figure by more than three tons, and is nearly twenty tons more than was flown over this route in March, 1930.

National Air Transport also reported a steady increase in mail and passenger' traffic. In April passenger traffic between New York and Chicago increased more than 100 per cent over March and the increase in mail carried over the system was about 20,000 pounds. As the bulk of the passenger traffic of this line consists of salesmen and executives of industrial concerns, officials feel that the increases indicate a decided renewal of business activity.

Transamerican Airlines Corporation also reported an unprecedented volume of traffic.



FLIERS • • •

—make the Aircraft Market in SOUTHERN CALIFORNIA!



THE United States Department of Commerce Air Bulletin dated April 15, 1931, shows that there are more aircraft, more pilots, more civilian fliers, more aviation mechanics, in California than in any other state in the Union, and 70% of the air activity of California is in Southern California.

			PILOTS						
	Air craft	*Glid-ers*	*Trans-port*	*Ltd. Com.*	*Indus-trial*	*Pri-vate*	*Total Pilots*	*Glider Pilots*	*Mechcs.*
CALIFORNIA	1169	242	995	227	24	1640	2886	79	1668
NEW YORK	1157	115	532	184	10	861	1587	23	881
ILLINOIS	687	63	385	124	7	457	973	16	555
OHIO	588	101	344	115	0	376	835	13	513
PENNSYLVANIA	509	40	238	136	9	463	846	2	403



In addition to the largest market per capita for airplanes for civilian and transport use, Southern California offers these decided advantages for the operation of an aircraft factory:

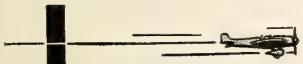


Unsurpassed climatic and flying conditions
Well situated plant sites on most favorable terms
Lowest building and maintenance costs
Favorable conditions for open air work
Cheap and abundant electric power, natural gas, and water.

Planes pictured in this advertisement are from Howard Hughes' magnificent motion picture "Hell's Angels."

These advantages are aiding local manufacturers of aircraft. Such names as Douglas, Lockheed, Kinner, Emsco, Bach, Northrop, are known throughout the country for their accomplishments. These advantages are open to you also, and we would welcome the opportunity of being of service in bringing them into play in your behalf.

The Industrial Department of the Los Angeles Chamber of Commerce will gladly furnish you complete detailed surveys and full information upon request and without obligation.



LOS ANGELES COUNTY

Flying All-Year

NEW STREAMLINED TIRE

STREAMLINED to present minimum resistance to the air, in flight, the new General Streamline airplane tire, which has been in development for more than a year, was announced recently by the General Tire and Rubber Company. The U. S. Army Air Corps coöperated with the General company in the development of this new type of tire, which was tested under Air Corps supervision at Wright Field, Dayton, Ohio.

The tire was announced after its efficiency had been demonstrated by these tests and by others conducted by the Daniel Guggenheim School of Aeronautics at New York University and by the Bureau of Aeronautics at the University of Michigan. All aerodynamic tests, including wind-tunnel tests, were successfully passed .

In the general shape of a triangle, the narrowest part of the tire is at the tread. Uninflated, the tire is an exact triangle. When inflated with air pressure of from ten to fifteen pounds, it resembles the form of a parabola.

The General Streamline tire is mounted on a new type of wheel. This wheel is constructed to permit adequate brake equipment to be installed. Due to the parabolic shape of the cross section of the tire, increased stability results, reducing the possibility of ground-looping, according to Robert Iredell, chief engineer of the General company. This is explained by the fact that the triangle is the only geometric figure that will support itself.

The bead of the General Streamline tire is mechanically clamped to the rim of the wheel to make it impossible for the tire to pull loose from the wheel under stress. Clamping the bead to the wheel also makes the wheel airtight, so that the Streamline tire may be used without an inner tube, if desired, reducing the weight of each wheel approximately three pounds. For the present, however, the tire will be produced with inner tubes.

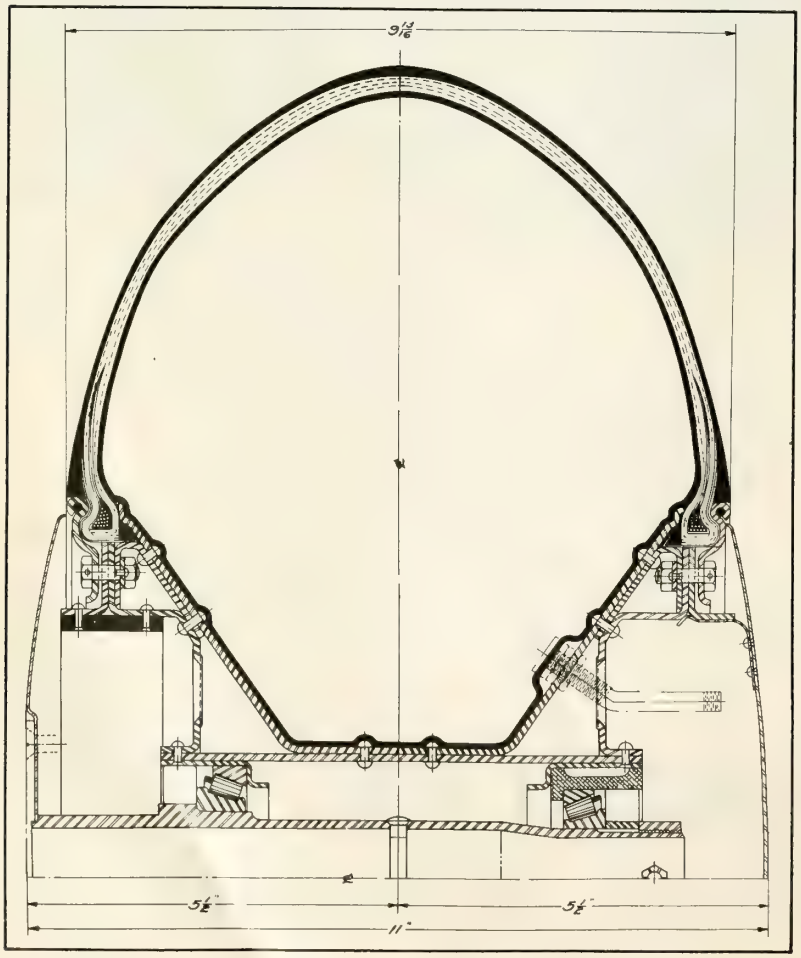
Brakes have been installed, tests having shown the particular type used to be exceptionally efficient. The bead seat diameter of the wheel in the smaller sizes is more than twice that of the ordinary airplane tire of the "doughnut" type.

As rapidly as possible, the General company will put into production the Streamline tire designed to replace the four-inch, five-inch, six-inch, eight-inch and ten-inch high-pressure airplane tires. Tail wheels in two sizes will be produced.

Army Air Corps officers at Wright Field have been especially interested in the larger wheel diameters in the General Streamline tire, which is especially designed for landings and take-offs on rough fields in war time.

Metal "pants," used to cut down the parasitic drag, are not necessary with the Streamline tire. These pants, which make greater speed possible with less horsepower, weigh from twenty-five to fifty pounds and must be removed to adjust tires or wheels.

Alger G. Maranville, General Tire and Rubber Company aeronautical engineer, has been in charge of the designing of the new Streamline tire and has been supervising the various tests.



Section and dimensions of the General streamline airplane tire and wheel

MOMENTS DUE TO ROLLING AND YAW

N A. C. A. Report 379, by Montgomery Knight and Carl J. Wenzinger, presents the results of a series of autorotation and torque tests on four different rotating wing systems at various rates of roll and at several angles of yaw. The investigation covered an angle-of-attack range up to 90° and angles of yaw of 0°, 5°, 10°, and 20°. The tests were made in the five-foot, closed-throat atmospheric wind tunnel of the National Advisory Committee for Aeronautics. The object of the tests was primarily to determine the effects of various angles of yaw on the rolling moments of the rotating wings up to large angles of attack.

It was found that at angles of attack above that of maximum lift the rolling moments on the wings due to yaw (or side slip) from 5° to 20° were roughly of the same magnitude as those due to rolling. There was a wide variation in magnitude of the rolling moment due to yaw angle with both angle of attack and with pb/2V. The rates and ranges of stable autorotation for the monoplane models were considerably increased by yaw, whereas for an unstaggered biplane they were little affected. The immediate cause of the rolling moment due to yaw is apparently the building up of large loads on the forward wing tip and the reduction of loads on the rearward wing tip.

MIDGET DRILL

DEVELOPMENT of the CP 11 midget rotary drill was recently announced by the Chicago Pneumatic Tool Company, New York City. This light weight drill is especially designed for continuous ¼-inch drilling in airplane and light metal construction. It is designed to require low air consumption and is built of as few parts as possible to reduce maintenance. Threaded flange holds the motor and gear case together. The spindle, located in the center of the housing, is of line drive construction. Throttle parts are rustproof.

SIGHTSEERS PAY PROFITS



More people are air-minded than ever before. Just about everyone wants to go up in the air.

This urge can be turned into handsome profits by the airport — by the airport that has the ideal ship for sightseers — the Fokker Super-Universal.

This famous plane thrives on the ups and downs and abuse of short hops. It is economical to operate, speedy and durable.

There are six passenger seats and baggage or lavatory room. Pratt & Whitney 425 h. p. "Wasp" engine.

The same traits that make the Super-Universal so perfectly suited to sightseeing trips, cause this ship to show pleasing profits in feeder lines, charter and taxi work at airports.

A Few Genuine Bargains

We have available at very low prices a few Super-Universals and other Fokker planes that have been used as demonstrators, as follows:—

SUPER-UNIVERSAL	F-14A MAIL PLANE
STANDARD UNIVERSAL	F-10A TRIMOTOR

These airplanes are in fine mechanical condition, new-looking and fully guaranteed by us. There aren't many of them but they offer unusual opportunities for profits this summer.

• FOKKER •

AFFILIATED WITH GENERAL MOTORS CORPORATION

FOKKER AIRCRAFT CORPORATION OF AMERICA, GENERAL MOTORS BUILDING, NEW YORK

DIGEST OF FOREIGN TECHNICAL ARTICLES

By Elsa Gardner

MEASURING VISION RANGE

Measuring the Vision from the Cockpit of Different Types of Airplanes (Messung der Sicht vom Führersitz verschiedener Flugzeugmuster), G. Kurz. Zeitschrift fuer Flugtechnik und Motorluftschiffahrt, Vol. 22, No. 6, March 28, 1931, pp. 167-176, 29 figs.

AS a result of research undertaken by the Deutschen Versuchsanstalt Fuer Luftfahrt and described in this report, a procedure was developed for measuring the range of vision from the pilot's cockpit of any airplane. The apparatus required for making such measurements was designed and the vision range of six airplanes was tested, including the Dornier Merkur, Junkers F-13 and W-33, Heinkel H.D. 44, Junkers A-35, and the Albatros L-75. Among the instruments described is a bearing angle built to measure the range and a special recording camera, which proved very useful.

From a comparison of measurements made on different types of airplanes, a master vision range was produced which would be of importance both in flying over the land and in landing. As the least requirement for vision range, it has been proposed that all around this master range the vision should be unobstructed for all kinds of airplanes, the limits being determined by a plan of the angles.

SUPERCHARGERS

Equipment for a Power Plant—Superchargers (L'équipment du groupe moteur-compresseurs), P. Leglise. L'Aéronautique, Vol. 13, Nos. 142-143, March and April, 1931, pp. 101-109 and 141-149, 30 figs.

THIS continues the descriptions of aircraft engine accessories (the last being published in No. 128, December, 1929 issue), and deals with superchargers. Under the section devoted to exhaust-type superchargers, complete details of the Rateau supercharger are given. The Farman geared mechanical control used with it is explained and the means of obtaining this control for three speeds is illustrated.

Other systems of mechanical control employed on the supercharger of the Bristol Jupiter engine and on the 700-horsepower Renault ventilator are taken up. The new Dugelay-Worthington and the P. Z. volumetric superchargers are described and the superchargers employed on the Armstrong-Siddeley and Pratt and Whitney engines are illustrated. Different types of superchargers are compared and the problem of mounting accessories is discussed.

STROBOSCOPIC STUDY OF PROPELLERS AND ENGINES

Study of Propellers, Fuel Injectors, and Engines in Operation by the Stroboscopic Process and by Photographs at a speed of a millionth of a second (Etude des hélices, des injecteurs et des moteurs en fonctionnement par la méthode stroboscopique et par la photographie au millionième de seconde), L. Seguin and A. Seguin. L'Aéronautique, Vol. 13, No. 143, April, 1931, pp. 132-135, 10 figs.

THE inventors of the Stroborama describe its design and applications to the study of aeronautical parts in motion, the apparatus permitting photographs to be taken at the rate of a million per second. The first application is to a study of fuel injection in a heavy-oil engine for aircraft, which was demonstrated by Clerget. It is said that by means of the Stroborama a study may be made of the form and arrangement of the orifices, and elasticity of the piping and different parts of the pump, and that irregularities of injection and penetration may be investigated in function of the compression, speed of injection and supply.

The application of this apparatus to the study of the operation of different aircraft engine parts, such as the valves, springs, cams, crankshafts and propeller shafts, as well as to propellers is also discussed.

ENGINE FUELS

Experimental Research on the Use of Diluted and Highly Preheated Fuel Mixtures in a Carburetor Engine (Ricerche sperimentali sull'uso di miscele diluite e di miscele fortemente preriscaldate nei motori a carburazione), A. Capetti. Aerotecnica, Vol. 11, No. 3, March, 1931, pp. 255-268, 12 figs.

THE author reports the results of an investigation to determine the effects of the nature of the fuel (gasoline, alcohol, and alcohol and ether), the amount in the fuel mixture, the air temperature before entering the carburetor, and throttling on the efficiency of the engine. In regard to the effect of diluting various fuels, it is concluded that alcohol may be diluted to a greater extent than gasoline and, in fact, that the maximum efficiency obtained with alcohol is 17 per cent greater than with gasoline and the dilution less than 14 per cent.

With reference to detonation, it was proved that it did not take place even with feeding temperatures around 130 degrees Centigrade, provided that the mixtures were rich enough and the advance of the ignition suitably decreased, but that it took place with poor mixtures. It seems that in this case dilution is a more important factor than temperature. On the whole, the results of the research demonstrate that more economical operation may be secured by diluting the mixture up to a certain limit exceeding the maximum efficiency, and further by throttling.

HEAVY-OIL ENGINES

New Models of Light Diesel Engines for Aviation (Les nouveaux modèles de moteurs Diesel légers pour l'aviation), G. Delanghe. Genie Civil, Vol. 48, Nos. 13 and 14, March 28 and April 4, 1931, pp. 309-313 and 337-340, 15 figs.

NEW types of Diesel engines for aircraft are described and the paper presented by Clerget before the Fifth International Congress of Aerial Navigation, taking up the design of his Diesel engine and possible attainments in this field, is quoted. The design of the Sunbeam-Coatalen six-cylinder in-line engine, which develops 112 horsepower at 1,500 revolutions per minute, weighs 1.75 kilograms per horsepower, and is at present in the test stage, is explained. British designs of Diesel engines are reviewed with reference to the opinions of Pye expressed in his article abstracted in the preceding issue of AERO DIGEST. Comments are made on the intake system of the Ricardo engine which obtains the same mean effective pressure as the Packard engine but with a very much higher mean piston speed.

Two-cycle engines are defined according to their method of distribution and the opinions of Pye on the possibilities of developing the two-cycle Diesel engine for aviation are set forth. Details of the Tartrais, Junkers, Zoller, Trojan, Attendu, M.A.N., and Burmeister and Wain engines are given.

ENGINE VALVES

Air Flow through Exhaust Valve of Conical Seat, K. Tanaka. Tokio Imperial University—Aeronautical Research Institute—Report No. 67, Vol. 6, No. 1, January, 1931, 24 pp., 6 tables, 23 figs.

THIS is a continuation of the author's research on air flow through a suction valve with a conical seat, and flow through an exhaust valve is studied. The different flow characteristics between the two are pointed out, since, in the case of the former, air flows from the suction pipe into a cylinder of large diameter, diverging through the suction valve, while in the latter case the flow is from the cylinder into the exhaust pipe of small diameter, converging through the exhaust valve.

The author points out that in divergent flow in the case of the suction valve, two-dimensional flow is similar to the practical flow of three dimensions, but that in convergent flow such as in the exhaust valve, this is not true and a particular consideration is necessary to apply it to practical flow in three dimensions. The results of comparative experiments made by changing the valve profile are illustrated.

CALCULATING AIRPLANE PERFORMANCE

The Application of the Method of Operators to the Calculation of the Disturbed Motion of an Aeroplane, L. W. Bryant and D. H. Williams. (British) Aeronautical Research Committee—Reports and Memoranda No. 1346 (Ae. 478), July, 1930, 13 pp.

THE method of operators is discussed, which method may be employed in the computation of motion due to applied forces and couples in the investigation of low-speed control and spinning of airplanes. A treatment of simultaneous linear differential equations of the first order is given, following a presentation by Jeffreys in a recent mathematical tract.

The eight simultaneous equations defining the general motion of an airplane in three dimensions are taken as examples in the explanation of the method, and the types of solution corresponding to real, complex, and repeated real roots of the stability equation are indicated. The cases of lateral and longitudinal disturbances from steady straight flight are considered in detail, and the operational forms in terms of the derivatives are given, expanded and ready for computation.

(Continued on following page)



The demand of the passenger

is for safety and comfort—the operator must have the economical operation which produces profits. In no other airplane yet produced in the world, are these two prime requirements combined as they are in the single-engined Bellanca AIRBUS.

THE AIRBUS—12 TO 15 PLACE: PILOT WITH 11 PASSENGERS AND 1,075 LBS. OF BAGGAGE AND CARGO, OR 15 PASSENGERS AND 450 LBS. OF BAGGAGE. RANGE, 570 TO 700 MILES. CRUISING SPEED 124 M.P.H.



THE PACEMAKER and THE SKYROCKET—6 PLACE MONOPLANES WITH WHIRLWIND 9, WASP JR., PACKARD DIESEL and WASP ENGINES

The same excellent characteristics are embodied in the Pace-Maker and the Wasp-engined Skyrocket, both 6-place ships which are known the world over for their extraordinary performance, and have earned for Bellanca an unparalleled record for safety and endurance.

PAYLOAD: twice that of other single-engined transport planes of similar horsepower. Consists of 15 passengers and their baggage or 11 passengers and 1,075 lbs. of baggage, freight and mail. Also supplied as a private owner's cruiser, with every luxury of appointment.

OPERATING COST: half that of multi-engined airplanes of similar load capacity. The single Cyclone or Hornet engine is economical to operate and utterly reliable. Fuel for 570-700 miles, according to payload required, is provided.

SAFETY: due to that perfection of flying qualities, control, and quiet comfort which only the single-engined airplane provides, as the history of aviation has proved.

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BELLANCA

(*Continued from preceding page*)

WIND TUNNEL CONSTRUCTION

Making a Compressed-Air Tunnel, A. J. Grant. Aircraft Engineering, Vol. 3, No. 26, April, 1931, pp. 93-96, 6 figs.

DIFFICULTIES experienced by John Brown and Company in meeting the requirements of the National Physical Laboratory in the construction of the steel shell for the new compressed-air tunnel are described by the Managing Director of that company with an explanation of how these difficulties were overcome. The results of riveted joint tests are given and a special form of joining used to prevent leakage between different sections is illustrated. The author outlines the rolling and machining processes involved in the construction of the shell and refers to the problems arising in erecting and transporting the completed structure.

WIND TUNNEL TESTS

Variable Density Wind Tunnel Test Data on Models of the Hawker Hornbill Aeroplane and the AD-1 Aerofoil Section, W. S. Diehl and R. F. Anderson. (British) Aeronautical Research Committee—Reports and Memoranda No. 1357 (Ae. 488), June, 1930, 9 pp., 11 figs.

THIS is a report communicated by the National Advisory Committee for Aeronautics to the British Aeronautical Research Committee giving the results of tests conducted at their request in the variable-density wind tunnel. The purpose of the tests was to supply data for use in the study of the unusual high angle stability and control observed in flight tests of the Hawker Hornbill airplane.

The flight tests had been made with and without slots and their effect on the control had been found to be extremely small. Stability at the stall, without slots, appeared similar to that of many airplanes with automatic slots. This stability was then attributed to the AD-1 airfoil and it was suggested that further investigation of its properties be undertaken by the N. A. C. A.

The variable-density tunnel tests showed that the AD-1 lies in the class of airfoils having a low maximum lift coefficient and a flattened lift curve peak. Scale effect on the AD-1 and Hornbill models was similar and was favorable for both lift and drag. Results for lift coefficients near stall were found to be in good agreement with flight test data.

BRITISH WIND TUNNEL

The 5 Ft. Open Jet Wind Tunnel, R. A. E., F. B. Bradfield. (British) Aeronautical Research Committee—Reports and Memoranda No. 1364 (Ae. 492), November, 1930, 11 pp., 11 figs.

THE open-jet enclosed-return passage wind tunnel installed by the Royal Aircraft Establishment is described. The design, which is largely due to R. McKinnon Wood, has been based on the Göttingen tunnel, but is more compactly arranged. The open jet is five feet in diameter and nine feet long. The maximum wind speed with a 50-horsepower motor overloaded 60 per cent is 170 feet per second. The structure has been designed to withstand greater pressures, so that a larger motor might be substituted. The power factor is 0.38 with a fan efficiency of about 90 per cent. As the tunnel has been made very compact, the expansion ratio is only three and one-half to one. The volocity in the jet varies by plus or minus one and one-half per cent from the mean over the central 4-foot diameter of the jet without any honeycomb.

ENGINE MANUFACTURE

Modern Aero-Engine Production, J. C. Briggs. Aircraft Engineering, Vol. 3, No. 26, April, 1931, pp. 80-86, 28 figs.

PROCESSES employed by Armstrong-Siddeley Motors in the manufacture of the 14-cylinder 400-horsepower radial air-cooled Jaguar engine at its plant in Coventry are outlined. In the introduction of the article, the author compares power units constructed in 1910 with those of the present day, and considers the requirements of design in the modern engine, explaining in what way the Jaguar fulfills them. He refers particularly to the methods used in boring cylinder holes, testing bore diameters, crankshaft balancing, forming connecting rods, and testing cams.

AERODYNAMICS

On Rendering Air Flow Visible by Means of Hot Wires, H. C. H. Townend. (British) Aeronautical Research Committee, Reports and Memoranda No. 1349 (Ae. 481), October, 1930, 5 pp., 5 figs.

A METHOD is described for delineating the flow pattern around bodies mounted in an airstream by means of fine wires electrically heated in a manner similar to the hot-wire anemometer. It was found in tests that if such a hot wire is placed normal to a current of air, the thin band of heated air in its wake persists coherently for some distance downstream, and that, due to its reduced density, it will cast a shadow on a screen if suitably illuminated. Some experiments made to determine the possibilities of this method of observing air flow and photographic results conclude the report.

WIND TUNNEL DESIGN

Tests on a Wind Tunnel Model (Versuche an einem Windanalmodell), M. Schilhansl. Zeitschrift fuer Flugtechnik und Motorluftschiffahrt, Vol. 22, Nos. 4 and 5, pp. 107-117 and 147-149, 22 figs.

THE tests described were undertaken by the Deutschen Versuchsanstalt Fuer Luftfahrt in order to determine the type of wind tunnel in which the air in the measured area would flow with the greatest possible uniformity, with respect to time and locality, and with the least possible expenditure of energy. The results with models furnish a sufficient foundation for the construction of a large wind stream installation. By means of systematic changes in the tunnel form, an improvement in the performance ratio was obtained by the arrangement with an open measured area. From the estimated values it is considered that comparatively small Reynolds numbers may be measured in the full sized tunnel, and efficient performance ratios may be expected. Differing from the model, in the full-scale tunnel, the cross-section area of the throttle regulating the opening was decreased so that only a suitable decrease of performance ratio took place and a small negligible variation remained.

R-101 DISASTER

Report of the R-101 Inquiry. Presented by the Secretary of State for Air to Parliament by Command of His Majesty, March, 1931, 129 pp., 23 figs. and weather charts.

THE investigation undertaken to determine the cause of the loss of the R-101 airship is described in detail, beginning with a sketch of the course of airship development in England before the construction of the R-100 and R-101 was considered. The conditions to be fulfilled by the latter airships are outlined with details of their design and construction, preliminary trials and reconstruction of the R-101. Reasons are stated for the decision to start the Indian flight and the incidents of the last flight are described in detail.

From the evidence presented the unanimous view of all three members of the Court of Inquiry was that the disaster was caused by a substantial loss of gas in very bumpy weather. It was considered probable that the more serious and sudden loss of gas which followed was connected with a specific misfortune such as the ripping of the fore part of the envelope, as something of this sort had happened on a previous occasion and no amount of care could assure that it would never happen again. In the appendices are described the design of the gas valves of the R-101, meteorological considerations, and the experiments and calculations carried out at the National Physical Laboratory to ascertain what would be the theoretic movement of the R-101 in various assumptions as to loss of gas, angle of elevator, increasing pressure due to buffets of wind, and other data. The experiments were undertaken on a four-foot model, which precisely reproduced the external form of the R-101.

WELDING

The Welding of Metals and Its Application to Aircraft Construction (La saldatura dei materiali metallici, le sue applicazione nelle costruzioni aeronautiche), G. Guzzoni and E. Nardi. Aerotecnica, Vol. II, No. 3, March, 1931, pp. 269-309, 26 figs.

THE conditions upon which the success of oxyacetylene welding depends are set forth and the importance of preparation of the parts to be welded in order to avoid strains and internal stresses are explained together with the results of tests. The drawbacks of this type of welding are discussed and the effects of thermal treatment of the whole welded part or of the section around the weld are shown. Other means taken to improve welding where the metal is at the melting point, and consequently possesses low mechanical properties, are described. The main mechanical tests, macroscopic and microscopic inspections, and non-destructive tests are taken up.

In regard to the best materials for welded aircraft structures, the authors consider chrome-molybdenum steel the only steel adapted to this purpose. In regard to the ultra light alloys, the authors give rules for welded aluminum. They consider duraluminum welding too difficult and recommend riveting for duralumin construction. They remark that among the magnesium alloys, Elektron only has good welding properties, and even this metal requires appropriate methods.



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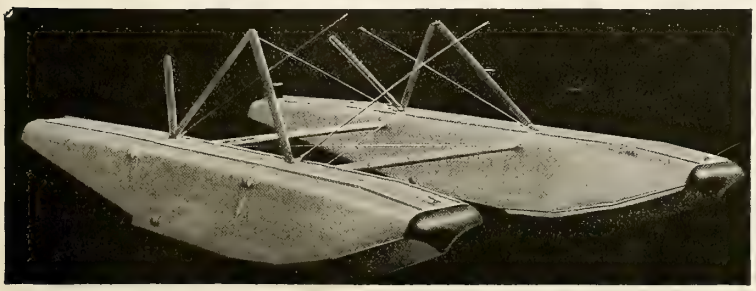
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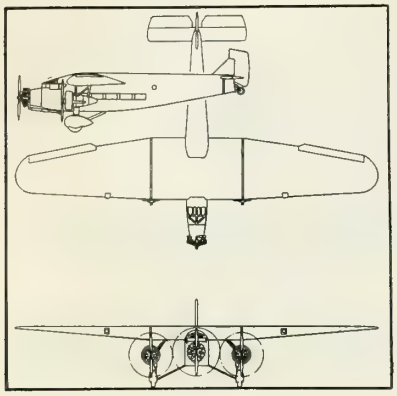
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Approved Type Airplanes Now in Production (Continued from May Issue of Aero Digest)

FORD
5-D
Ford Motor Company
Dearborn, Mich.

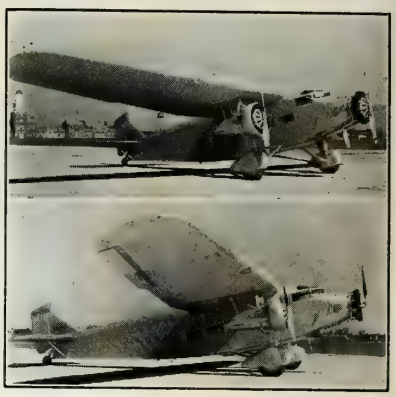
Specifications: Span, 77 feet 10 inches. Length overall, 50 feet 3 inches. Height overall, 12 feet 8 inches. Wing area (including ailerons), 835 square feet. Power loading, 10.70 pounds per horsepower. Wing loading, 16.18 pounds per square foot. Three Pratt and Whitney Wasp engines at 420 horsepower. Weight empty, 7,840 pounds. Disposable load, 5,660 pounds. Payload, 3,403 pounds. Gross weight, 13,500 pounds.



Performance: High speed, 150 miles per hour. Cruising speed, 122 miles per hour. Stalling speed, 64 miles per hour. Rate of climb, 1,050 feet per minute. Climb in 10 minutes, 8,000 feet. Service ceiling, 18,500 feet. Radius, 560 miles. Gasoline capacity, 277 to 355 gallons.

Other models of this plane are the 5-D-S seaplane powered with three Wasp 420-horsepower engines; 6-AT-S seaplane powered with three J6 or Wasp, Jr., engines at 300 horsepower; and 7-AT landplane powered with three J6 or Wasp engines at 340 horsepower.

The fuselage is of duralumin bars and sheets. Covering of fuselage, control surfaces and wings is of corrugated duralumin. Landing gear supporting tubes, motor mounts and braces are of chrome-molybdenum steel. The wing is of cantilever construction. Three main spars are inter-connected with nine rib trusses on each side. Five auxiliary spars are located transversely between the main spars. The location of the mail compartments is such that when drawn back into the wing they serve to strengthen the wing structure by virtue of their girder-type trusses. Ailerons are fitted on the wing tips.



FORD
4-AT-E
Ford Motor Company
Dearborn, Mich.

Specifications: Span, 74 feet. Length overall, 49 feet 10 inches. Height overall, 11 feet 9 inches. Wing area (including ailerons), 765 square feet. Power loading, 11.27 pounds per horsepower. Wing loading, 16.92 pounds per square foot. Three Wright J6 or Wasp, Jr., engines at 300 horsepower. Weight empty, 6,500 pounds. Disposable load, 3,630 pounds. Payload, 1,725 pounds. Gross weight, 10,130 pounds.

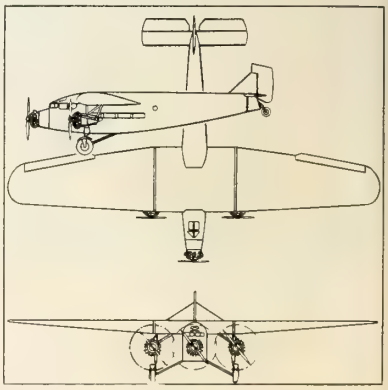


Performance: High speed, 132 miles per hour. Cruising speed, 107 miles per hour. Stalling speed, 57 miles per hour. Rate of climb, 920 feet per minute. Climb in 10 minutes, 7,200 feet. Service ceiling, 16,500 feet. Radius, 570 miles. Gasoline capacity, 231 gallons.

The fuselage framework is of duralumin throughout; the skin is of duralumin sheets coated with pure aluminum and corrugated to increase the strength. The gasoline tanks are of aluminum; motor mounts and braces are of chrome-molybdenum steel.

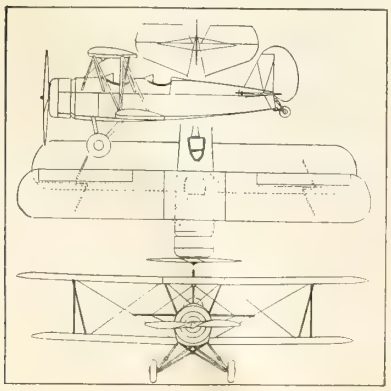
The wing is of cantilever construction and is made up of three sections. Each section is made up of three main spars and five auxiliary spars. There are nine rib trusses on each side of the fuselage. The wing is bolted into place with steel bolts through steel forgings both of which have a tensile strength of 125,000 pounds to the square inch. The landing gear has a tread of 16 feet 9 inches; the supporting tubes are of chrome-molybdenum steel.

Dep control is provided. Instruments include air speed indicator, altimeter, compass, clock, turn and bank indicators, tachometer, fuel gauges.



CURTISS
SPORT TRAINER
Curtiss-Wright Airplane Company
Wichita, Kansas

Specifications: (Warner and Kinner-powered, respectively) Span, 28 feet 10 inches. Length overall, 20 feet 10 inches. Height overall, 8 feet 10 inches. Wing areas (including ailerons), 206 square feet. Power loadings, 16.2; 14.3 pounds per horsepower. Warner 110-horsepower engine and Kinner 125-horsepower engine. Weights empty, 1,167; 1,157 pounds. Useful loads, 633; 643 pounds. Gross weights, 1,800; 1,800 pounds.

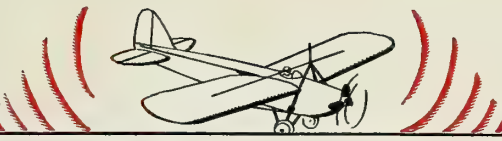


Performance: High speeds. 117; 112 miles per hour. Cruising speeds, 98; 95 miles per hour. Landing speeds, 45; 45 miles per hour. Rates of climb, 750; 800 feet per minute. Service ceilings, 12,500; 14,000 feet. Radii; 410; 400 miles. Gasoline capacities, 33; 33 gallons.

The fuselage is of conventional welded chrome-molybdenum alloy steel tubing braced throughout by a system of steel tube members. The engine mount is a detachable unit. The control surfaces, wings and fuselage are fabric covered. The rudder uses a horn-type balance. The wings are of the conventional wood-fabric construction incorporated into a high lift section. An efficient system of drag bracing is produced by the tie rods, compression tube members and backing plates.

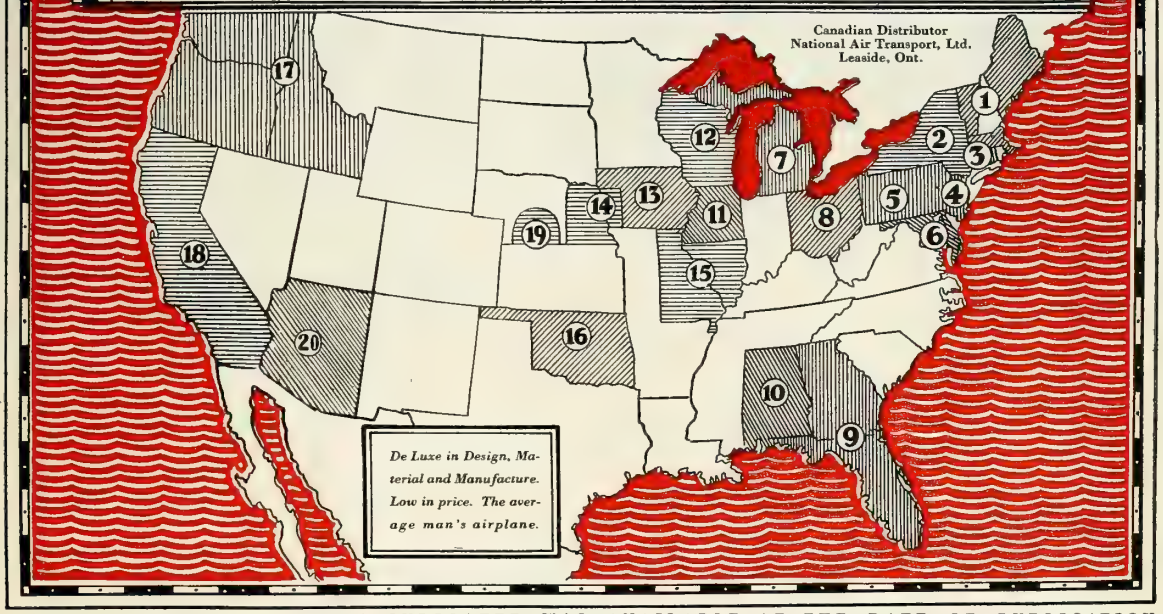
The undercarriage consists of a split-axle wheel chassis and a shock absorbing tail skid. Standard Travel Air oleo-spring shock struts are secured to the structure and Vees by means of bronze universal joints, providing hinge facilities. The chassis Vees are of chrome-molybdenum steel and attach to the Zerk-equipped hinge fittings. The Sport Trainer accommodates two persons and 83 pounds of baggage.





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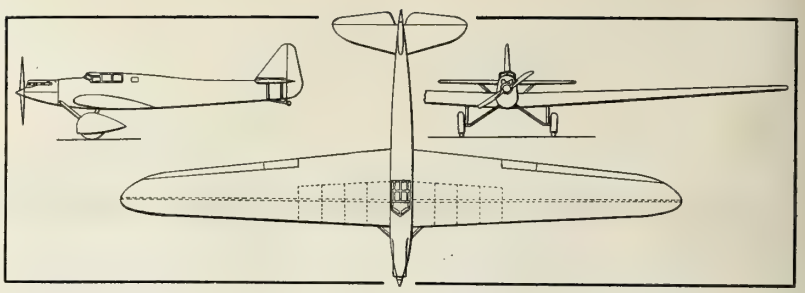
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ENDURANCE MONOPLANES OF FRANCE

By

Paul E. Lamarche



Scale outline drawings of the record-breaking Dewoitine D.33 monoplane

ON March 1st France regained the world endurance and distance records (the latter since broken by Paillard and Mermoz) for closed circuit flight. Bossoutrot and Rossi had flown their Blériot 110 monoplane continuously for 75 hours and 23 minutes, during which they covered a distance of 8,805 kilometres. By so doing they surpassed the records established by the Italians, Maddalena and Cecconi, who remained in the air for 67 hours and 15 minutes, during which time they flew a distance of 8,188 kilometres in June of last year.

This record-breaking flight of Bossoutrot and Rossi, which started and ended at the aerodrome of La Senia in Oran, was accomplished in a Blériot monoplane designed especially for endurance flights by M. Zappata, a well-known Blériot engineer. It is one of three French endurance planes built during the past year. The other two were constructed by Dewoitine and Bernard. During the past few months all three planes have established new records of one category or another.

A new world record for distance in a closed circuit was established on April 2nd by Antoine Paillard and Jean Mermoz, when they flew the Bernard *Oiseau Tango* over a distance of 9,100 kilometres in 59 hours of flight, thereby eclipsing the record recently set up by Bossoutrot and Rossi, who on March 1st first attained the 8,805 kilometres distance record.

Marcel Doret and Joseph le Brix recently established seven new world records in the big D-33 Dewoitine monoplane, the *Trait d'Union*. On March 23rd and 24th this all-metal monoplane was flown over closed circuits radiating from Istres in the South of France, carrying loadings up to 2,000 kilograms as fuel in the wing tanks. The seven new world records are as follows:

(1) Endurance with 500 kgs. loading —32 hours, 17 minutes, 48 3/5 seconds. Previous record by Costes and Codos, 23 hours, 22 minutes, 49 seconds.

(2) Distance with 500 kgs. loading. 4,662 kms. Previous record by Costes and Codos was a distance of 4,361 kms. 980.

(3) Distance with loading of 1,000 kgs. 32 hours, 17 minutes, 48 3/5 seconds. Previous record by Costes and Codos, 18 hours, 1 minute.

(4) Distance with loading of 1,000 kgs. 4,662 kilometres. Previous records by Costes and Codos, 3,309 kilometres, 900.

(5) Endurance with loading of 2,000 kilograms. 32 hours, 17 minutes, 48 3/5 seconds. Previous record by Reginensi and Lalouette, 16 hours, 59 minutes and 46 seconds.

(6) Distance with loading of 2,000 kilograms. 4,662 kilometres. Previous record by Reginensi and Lalouette, 2,678 kilometres, 600.

(7) Speed with 2,000 kilograms loading. 151 kilometres, 362. Previous record by Reginensi and Lalouette, 147 kilometres, 420.

The design of these three planes is interesting. The Dewoitine and Bernard planes are somewhat similar. Both are of the cantilever low-wing type. The Blériot is a slower and lighter plane of high-wing semi-cantilever construction, braced above and below by steel cables.

When fully loaded for the take-off on its record flight, the Blériot carried 6,250 litres of Stanavo gas and 300 litres of Castrol oil. In addition, sufficient provisions for four days were carried, including preserves, chickens, roasts, mineral water and coffee. The plane weighed seven and a half tons, making a wing loading of 95 kilograms per square metre.

The Blériot 110 has very clean lines for a plane of its size. Its construction has been very carefully planned so as to make it as light as possible. Actually the empty weight is 2,500 kilograms. Its weight fully loaded has exceeded 7,000 kilograms. Nevertheless, the plane has a good coefficient of security. M. Zappata has adapted the semi-cantilever wing as a means of reducing the weight. If the bracing system appears to adhere to obsolete design, it nevertheless has proved itself suitable for a plane of this type. Apparently the only sacrifice is speed. The system of bracing employed includes double cables above and below the wing, the top bracing cables being supported over the wing by two short masts.

The position of the pilot's cabin is interesting. It is in the rear and under the trailing edge of the wing. Although the visibility from this point is somewhat limited, it is considered sufficient for the purpose, particularly inasmuch as a periscope is provided for visibility straight ahead, after the manner of Lindbergh's *Spirit of St. Louis*. The cockpit is placed thus to enhance the crew's safety.

The wing is built up in three sections. It is semi-elliptical in form. Its center section is built into the top of the fuselage. The upper bracing cables are attached to two masts forming a cabane, which are counterbraced by short steel cables. The bracing wires extend from these masts to the mid-section of the wing spars. The lower cables are similarly attached to the wing spars at mid-section and reach to the lower part of the fuselage. The ailerons are balanced and have horns extending around the wing tips. The wing structure is built up entirely of wood. It is composed of two box spars of spruce with plywood webs, and ribs of spruce and plywood construction. The wing has a covering of fabric.

The fuselage was designed with the



The Dewoitine D.33 which established seven new world's records in France recently



The Bleroit 110 powered with a water-cooled Hispano-Suiza engine of 600 horsepower

object of minimizing head resistance. It is very deep, yet throughout its design very clean even though most of the fuel is carried in the fuselage. The plane has a keel and two top spars forming a beam of triangular section, the spars being united by a number of bulkheads of wood construction. The monocoque fuselage has a covering of moulded plywood. The engine is mounted on an easily demountable engine structure, behind which is á fire-proof bulkhead. At the center of gravity the principal fuel tanks are installed. Their total capacity is 6,000 litres.

The pilots occupy two seats in tandem, equipped with dual control. Access to the cabin is by a door on the left side of the fuselage. There are two windows on either side of the fuselage and one in the ceiling. The first two afford the pilot visibility forward and downward. All instruments are grouped on one panel,, which is so arranged as to be equally visible to both pilots. Behind the pilot's accommodations is a little cabin fitted with a berth where the off-duty pilot may rest during distance or endurance flights.

The horizontal empennage consists of adjustable stabilizers, which are braced above and below, and two balanced elevating flops. The vertical empennage includes a fin built integral with the monocoque fuselage and a balanced rudder. The empennage is of wood construction throughout.

The ship, as mentioned, is powered by a Hispano-Suiza 600-horsepower engine. It drives a metal monobloc Chavière propeller and is cooled by a Vincent Andre frontal type honeycomb radiator. In addition to the fuselage fuel tanks, there are wing tanks with a total capacity of about 1,000 litres. Oil is carried in special wing tanks, located in the center section, the exterior surfaces of which form radiators.

The landing gear is of the divided type. Each unit is composed of legs in Vee reaching from the bottom of the fuselage. An oblique arm fitted with shock-absorber is hinged to the fuselage at mid-height. The wheels are of large diameter.

Specifications

Span .....26 metres 500
Length .....14 metres 570
Height .....4 metres 900
Wing area.....81 square metres
Power
600 horsepower Hispano-Suiza motor
Weight of plane .....1,510 kilograms
Weight of fuel tanks.....215 kilograms
Weight of water, oil, etc...145 kilograms
Weight empty .....2,505 kilograms
Weight of fuel .....4,200 kilograms
Weight of equipment.....130 kilograms
Weight of crew.....160 kilograms
Weight of total loading..4,490 kilograms
Weight fully loaded.....6,995 kilograms
Wing loading
86 kilograms per square metre
Power loading
11 kilograms. 700 per horsepower
Power per square metre..7.4 horsepower
Maximum ground speed.....193 k.m.h.
Speed at 2,000 metres.....180 k.m.h.
Theoretical range.....11,000 kilometres

Although the other two French planes built especially for distance and endurance flights are larger and heavier than the Blériot, they are faster and carry greater loads.

Not much detail pertaining to the construction of these two planes is at present available. The Dewoitine was built last year and was offered by its owner, M. Francois Coty to Le Brix. It was rumored at one time that it would be used on a flight to South America in an effort to set a new record for distance in a straight line. The largest of the three planes, it is powered by a 650-horsepower Hispano-Suiza engine, type 12MB. The ship has a span of 28 metres. One might refer to this wing as an airfoil sectioned fuel tank. When this plane took off on its first attempt at the endurance record, it carried a load of 6,750 litres of fuel and 340 litres of oil, comprising a total of 8,700 kilograms. On its take-off, thus loaded, on January 16, it left the ground in 55 seconds after a run of 1,200 metres. During this flight the *Trait d'Union* was able to maintain an average speed of 143 k.m.h. The following are the specifications and performances of the Dewoitine plane:

Span .....28 metres
Length .....14 metres 400
Area of wing .....78.2 square metres
Weight empty.....3,000 kilograms
Disposable loading.....6,000 kilograms
Weight loaded.....9,000 kilograms
Maximum ground speed.....223 k.m.h.
Climb (with 4,500 kilograms loading)...6,000 metres in 53 minutes
Range.....10,000 to 12,000 kilometres

The big Bernard, type 80 Grand Raid low-wing monoplane was designed by MM. Galtier and Bechereau. It has particularly clean lines, with all projections neatly faired in by streamlined cowlings. It is of all-wood construction after other Bernard types. In size it is somewhat smaller than the Dewoitine, though it is a faster plane, having a maximum speed of 250 k.m.h. and a cruising speed of 185 k.m.h. On a most recent attempt to capture the endurance record, the Bernard plane weighed approximately eight

(*Continued on page* 124)



The Bernard Type 80 Grand Raid low-wing full cantilever monoplane of 650 horsepower



Performance ... In its class as a high speed utility plane and advanced trainer the Beta is without equal .. Companion to the *all-metal* Northrop Alpha Transport, the Beta, powered with the reliable Menasco Buccaneer engine, made the trip from Burbank to the Detroit Show in 15 hours, 43 minutes, at an average speed of 142 m. p. h., consuming but 8 gallons of fuel per hour. The plane cruised easily over the mountains at an altitude of 15,000 feet. Landings and take-offs were made without effort in the high altitudes at Salt Lake City and Cheyenne, Wyoming .. Northrop *all-metal* construction guarantees safety with the Beta's high performance. Yet this plane, with such pronounced sturdiness, weighs but 1135 pounds empty .. The Northrop

NORTHROP AIRCRAFT CORPORATION

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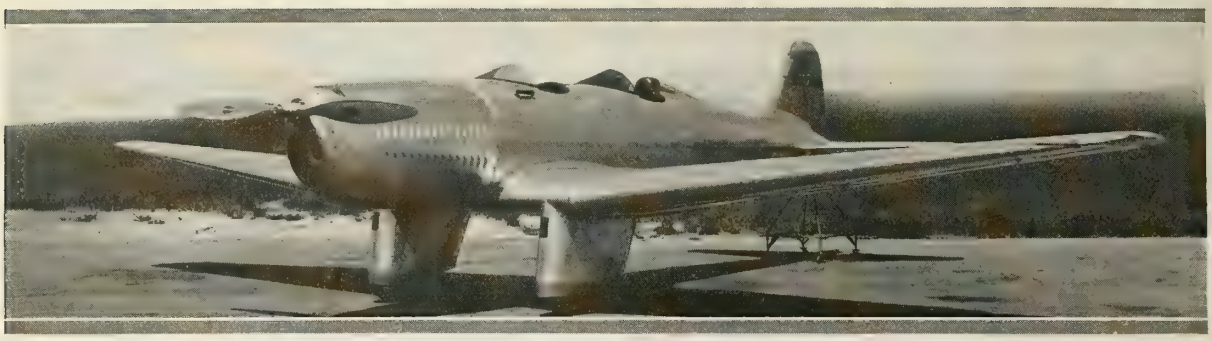
HROP



multi-cellular wing construction, requiring no auxiliary bracing, and the *all-metal* skin stressed fusilage reduces inspection, service and maintenance to a minimum and guarantees a life span measurably extended over the present standards ' ' The roomy cockpits offer comfort and unusual visibility for both pilot and passenger. The high degree of longitudinal, lateral and directional stability permits hands and feet off for an indefinite period, and the lightness of the control adds a new pleasure to flying ' ' Specifications will be gladly sent upon request. Dealers interested in the Beta, from a sales standpoint, are invited to write for information on their business letterheads.

UNITED AIRPORT, BURBANK, CALIFORNIA

REPRESENTATIVES: UNITED AIRCRAFT EXPORTS, INC., 230 PARK AVENUE, NEW YORK CITY



NORTHROP "BETA" MONOPLANE

THE Northrop Beta is an all-metal, tandem two-place, open-cockpit, low-wing monoplane powered with a Menasco Buccaneer engine of 160 horsepower. This ship was developed by the Northrop Aircraft Corporation of Burbank, Calif.

The wings and tail surfaces are of smooth Alclad stressed skin construction, employed in the Northrop Alpha. The method of fabrication is such that the resulting structures are in reality cellular box spars having unusual torsional stiffness. The all-metal monocoque fuselage has an Alclad skin with integrally formed longitudinal stiffeners and ring-shaped bulkheads of channel cross-section.

The upper and lower surfaces of the ailerons are hinged separately to the main wing surface with piano-type hinges. When the ailerons are actuated there is no gap between them and the wing.

A special streamlined cowl completely covering the engine is installed. An air scoop devised to cool the engine efficiently is incorporated in the cowl-installation. With the use of this cowl and air scoop it has been possible to obtain low cylinder head, cylinder flange and oil temperatures.

The construction of the landing gear embodies the use of full-cantilever air shock absorbers, incorporating Gruss Air Struts and permitting a streamlined pants-gear to be employed. The tail wheel, 6 inches by 2.5 inches, is full castor. The assembly comprises an oleo shock absorber of conventional type. Goodrich wheels, 6.50 inches by 10 inches, and brakes are provided.

Controls and instruments are installed within convenient reach of the pilot. According to the Northrop company, flight is possible for a time with all controls free and all controls are effective below stalling speed.

The Northrop Beta is produced entirely in natural metal, no pigment being applied to the surfaces.

A tail light is built flush with the termination of the streamlined fuselage.

Standard equipment includes Hamilton-Standard propeller, electric starter, fuel pressure gauge in both cockpits, full capacity gauge, set of three navigation lights, navigation light switch, instrument board light switch, master switch, Bosch or Scintilla engine switch, twelve-volt storage battery, fire extinguisher, passenger seat and cushion, pilot seat and cushion, safety belts for pilot and passenger, first aid kit, tool kit and cockpit covers. Pioneer instruments provided as standard equipment are magnetic compass, altimeter, air speed indicator, turn and bank indicator, oil pressure and oil temperature gauges in both cockpits and tachometer.

The Menasco Buccaneer B-6 engine which powers the Northrop Beta, is a six-cylinder, four-cycle, air-cooled inverted in-line aircraft powerplant developing 160 horsepower at 1,975 revolutions per minute. Bosch magneto and Stromberg carburetor are standard equipment. Fuel consumption is .54 pound per horsepower per hour and oil consumption is .006 pound per horsepower per hour. S. A. E. large type mounting is provided for hand inertia or electric starter. Weight dry of the engine less hub and starter is 365 pounds.

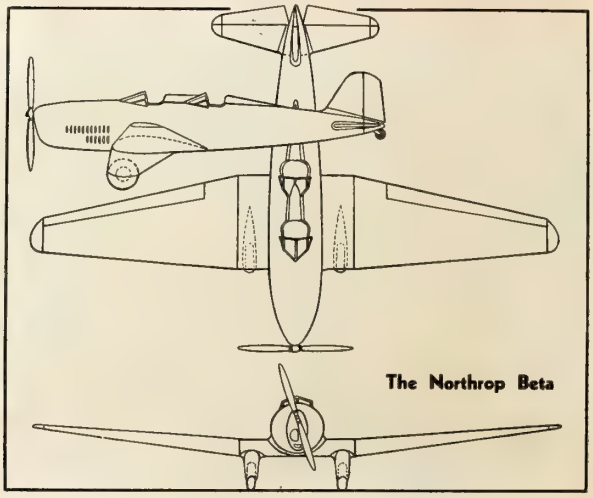
Specifications

Span	32 feet
Length overall	21 feet 8 inches
Height overall	6 feet 1 inch
Tread	5 feet 6 inches
Chord (at root)	70 inches
Chord (at tip)	25.25 inches
Dihedral angle	4 degrees
Wing area (including ailerons)	137 square feet
Aspect ratio	7.44
Wing loading	12.0 pounds per square foot
Power loading	11.1 pounds per horsepower
Maximum gasoline capacity	30 gallons
Maximum oil capacity	4 gallons

Performance

High speed	175 miles per hour
Stalling speed	48 miles per hour
Cruising speed (at 1,750 r.p.m.)	145 miles per hour
Climb (at sea level)	1,150 feet per minute
Climb (at 10,000 feet)	645 feet per minute
Climb (to 10,000 feet)	12.5 minutes
Take-off (time)	10 seconds
Take-off (run)	500 feet
Service ceiling	22,700 feet
Absolute ceiling	25,200 feet





The Northrop Beta

THIS ultra-modern airplane startled everyone attending the Detroit Show by its performance . . . Cruising from Los Angeles to Detroit at 142 m. p. h., consuming eight gallons of gasoline per hour at this speed and using two quarts of oil for the trip . . . such performance is possible only with an engine that takes advantage of the foremost principles of inline, inverted construction.

THE MENASCO BUCCANEER

160 H.P. at 1975 R.P.M.

MENASCO MOTORS, INC · · · 6718 McKinley Avenue · · · Los Angeles, California · U. S. A.



B. G. MICA AVIATION SPARK PLUGS

(Patented in the United States and Other Countries)



B. G. Hornet Spark Plugs

There is a B. G. Hornet Spark Plug to fit every make of air-cooled and water-cooled engine. The latest plugs are the 3B-1; 4B-1; and 5B-1 models. These cover the entire range of operation from the highly super-charged engines to cold weather idling conditions in standard engines. The improved design and construction of each of these plugs gives increased electrode life and enlarges the range of operation.



B. G. 1XA and 1XB Spark Plugs

There are four different types of B. G. Spark Plugs with one inch hex. They are the 1XA Regular; 1XA Extra Gap; 1XB Regular; and 1XB Extra Gap. These plugs are used with unusual success in almost all standard types of engines. The Extra Gap models are the same as the Regular models except for the extra gap which is built into the terminals. The Extra Gap type is preferred by many users because there is greater resistance to fouling under certain excessive oil conditions.

The Choice of Those Who Know

B. G.'s are the best known spark plugs in aviation. For years they have been the choice of those who realize that safety in flying depends as much on perfected spark plug performance as on any other factor. For this reason, in 1930, as in many previous years, B. G. plugs were used in practically every outstanding aviation event. B. G.'s have stood the test, proved their worth and deserve their popularity. That's why they are used by such leading companies as American Airways; Boeing Air Transport; Colonial Air Transport; Eastern Air Transport, Inc.; National Air Transport; National Parks Airway; New York-Philadelphia and Washington Airway Corporation; Northwestern Airways; Pacific Air Transport, Inc.; Pan-American Airways; Pennsylvania Air Lines; Southern Air Transport; Transcontinental and Western Air, Inc.; Thompson Aeronautical Corporation; United States Airways; Universal Air Lines, Inc.; Varney Air Lines, and others.

THE B. G. CORPORATION

Contractors to the United States Army and Navy

136 West 52nd Street, New York Cable Address: GOLSTECO, New York

BG

COMPOSITE WING AIR FLOW

(*Continued from page* 55)

camber line of the section. The effective angle and the induced angle of attack do not occur in the application; they were only temporarily introduced in order to assist in the explanation of the facts. The sum of the two above angles $\alpha + \alpha o$ is called the absolute angle of attack.

It must be observed from the beginning that the reduction of the lift in consequence of the incomplete lift-sustaining capacity of the span refers to the lift under given geometrical conditions. It does not refer to the maximum lift obtainable from a wing at a given speed, that is, to its maximum lift coefficient. That coefficient is determined by the effect of the air friction, and the previous arguments dealing with potential flows have nothing to do with it. Our results merely indicate that if the maximum lift coefficients are equal in spite of different lift sustaining capacities, they will be obtained at different angles of attack. The reduction of the deflecting capacity has to be made up by a larger angle of attack. That is what actually happens.

The center of pressure of a lift is solely determined by its pure wing section flow. This is a local effect and is, therefore, not effected by the downwash flow. The travel of the center of pressure in relation to the angle of attack is affected, however, by the downwash and there is less center of pressure travel within the same range of the angle of attack with a smaller span, because in that case the lift changes less. We shall come back to this when we discuss the wing section tests and the application of the theory.

The preceding discussion constitutes a greatly simplified account of the complete theory, but nevertheless one that contains all essential arguments and all practical results. Even the complete theory yields only the two main equations given, as long as we confine ourselves to simple engineering computations. It puts them into a clearer light indeed than the simplified theory can, but not into a broader one. It answers questions that remain puzzling in the simplified theory. Why is it, for instance, that the plan form of the wing, the distribution of the angle of attack along the span, the variation of the wing section along it, and similar details apparently have no influence whatsoever on the lift and on the induced drag? The strict theory shows that they really have such influence, but it shows also that this influence is only secondary. There exists a standard distribution of the lift along the span which gives the results exact enough for practical application and, therefore, permits dispensing with the investigation of the actual distribution. Theory fully accounts for the soundness of such summary procedure, and experience confirms it. It is safe practice to employ universally the two equations given in this article. The existence of such universal and simple relations, valid regardless of many design details, is indeed a fortunate circumstance which makes theoretical aerodynamics practical. The discovery of these relations was particularly difficult because their existence could not be predicted, and it marks one of the most satisfying accomplishments of science.

This concludes the discussion of wing theory. Its tangible results are laid down in two extremely simple equations. Practical conclusions from these results will be discussed in the articles to follow.

(*This is the twelfth of a series of articles by Dr. Max M. Munk. Copyright,* 1931. *All rights reserved.*)

NORTHROP BETA



Powered by Menasco Buccaneer

equipped with

ECLIPSE

ELECTRIC

STARTER

Like the vast majority of aircraft manufacturers, Northrop Aircraft Corporation presents its new Beta airplanes, equipped with the Eclipse Starter.

Recognizing the vital necessity of sure, positive starting, the selection of Eclipse was assured. Another tribute to quality, certainty and safety!

Eclipse Aviation Corporation

East Orange, N. J.

(Subsidiary of Bendix Aviation Corporation)

HEINKEL AMPHIBION



AFTER almost a year and a half of experimental testing in the water channel, wind tunnel, structural laboratory, on the water and in full flight, the Ernst Heinkel Flugzeugwerke of Warnemünde, Germany, has completed tests on its second amphibion of the type HE57. It is believed to be the first European built plane made according to United States Department of Commerce requirements with American engine, instruments, wheels, shock absorbers and all accessories, and designed with a view towards American methods of production. Besides meeting the Department of Commerce requirements, the stress analysis and drawings were prepared in accordance with the regulations of the Deutsche Versuchsanstalt für Luftfahrt (the German organization corresponding to the United States Department of Commerce. It is usually referred to as the D. V. L.)

The HE57 was designed and constructed especially for production in the United States. All work was done at the Warnemünde factory under the direction of Dr. Ernst Heinkel. Richard M. Mock, an American engineer, supervised the design, construction and tests of this plane. A first model was completed in April, 1930. After considerable testing and some modification, a second of the type was finished in December. It has been flying regularly since that time.

Powered with an American Pratt and Whitney 425-horsepower Wasp engine, the HE57 normally carries six people, baggage and fuel for four hours. This weight is in addition to an electric starter, storage battery, marine equipment, lavatory and water. The plane is quite conventional in design, being a high-wing, boat-type cabin amphibion with the engine mounted as a tractor well forward of the cockpit. It is far enough behind the forward hatch, however, to allow maneuvering on the surface without interference with the propeller. The wide hatch door makes it almost impossible for one to reach the propeller from this bow-deck opening. Bendix wheel brakes, and a combination water rudder and tail skid incorporating an oildraulic shock absorber insure good maneuverability on both land and water. The pilot sits quite high behind the well rounded deck, allowing excellent visibility forward and to either side. The side windows can be opened, providing vision to the rear.

The design was laid out so that an extra passenger can be carried if it is desired to remove the lavatory.

Structurally the Heinkel amphibion is entirely of duralumin, except for the wing beams and the fabric covering for the wings and tail. Flat sheet duralumin and dural plate are used throughout. In the entire boat hull, there are only about nine different bent sections providing a very simple type of construction. There are no closed sections in metal in the entire plane, except for some of the tubular struts. Every possible precaution against corrosion was taken.

The design was laid out so that, if desired, a Hornet engine can be installed without any changes. Because of the higher power of the Hornet, a higher load factor than would be necessary with a Wasp engine was employed. Thus, with a Wasp engine a few hundred pounds overload can be safely carried without danger. In addition, the entire structure satisfies the D.V.L. requirements, and since in many cases these differ from the Department of Commerce requirements, the plane is over-strength for either one of the two. The boat hull was designed and calculated for abnormally heavy sea conditions.

Every possible safety precaution has been taken. There are no gasoline and gasoline lines carried in the cabin. The engine mount is considerably over-dimensioned to reduce any possibility of such damage. There are five possible exits from the boat hull in the event of an emergency. Remote control fire extinguisher, life preservers, non-shatterable glass windows, safety belts, etc., are provided as standard equipment.

The landing gear is a result of a great deal of experimentation, and the present design has been continually proved to be satisfactory in service. In principle, it is hydraulic both for retracting and lowering the wheels, and for absorbing landing shocks. The retraction mechanism consists of a conventional oil piston and cylinder supplemented by a patented automatic locking device. The conventional hydraulic retracting mechanism carries the landing loads through the oil as far as a valve. This results in exceptionally high pressure in the oil, and the difficulty of keeping the system tight. By mechanically locking the landing gear in its extended position, the landing loads are carried through the mechanical locking device, relieving the oil system of this high pressure. Naturally, with the oil system tight, an additional safety feature is provided to diminish the possibility of a mishap in the mechanical lock. In principle, this lock is very simple. When the retracting strut is elongated to its full length, one continues to pump to build up a slight pressure in the oil in the cylinder. This additional pressure snaps the mechanical lock into place. To retract the wheels, the pressure is applied to the other side of the piston, which releases the mechanical lock and raises the wheels. A single two-position lever mounted on a double valve governs the entire system. Shock absorption is by two oildraulic shock absorbers arranged in tandem. The action of the landing gear is quite fast; the wheels drop practically of their own weight in less than 15 seconds and can be raised without effort in 60 seconds.

The wings in the HE57 are quite conventional, having spruce box spars and duralumin ribs. The ribs have drawcap strips fitted with special clips, providing easy attachment of the fabric without any sewing. This method of attachment is the result of a series of tests made last year at the Heinkel plant. Fuel tanks are contained in the wings between the spars. An air space is provided between the tanks and the sides of the boat, and on one side this is filled with a tool box having its cover flush with the surface of the wing. Thus, engine tools may be kept conveniently for working on the engine.

The engine nacelle shape is the result of considerable experimentation with the first plane. Tests were made with different types of wings, fairing and varying heights for the nacelle above the fuselage. The final shape is economical to produce, and is aerodynamically efficient. The engine compartment is easily accessible, with the cowl opening similar to the engine hood on an automobile. Two snap fasteners attach each side of the middle portion of the cowl. By the removal of one bolt at the rear, the entire rear cowling can be dismounted. The ring cowl is fitted with Fairey fasteners that permit the removal of any cylinder without disturbing the entire cowling.

The engine mount is of welded chrome-molybdenum steel tubing on which are mounted the units for all of the gasoline

piping, oil piping, storage battery, engine wiring, engine controls, oil and gasoline gravity tanks. These units are each designed so that they can be completely repaired and installed on the airplane with as little work on assembly as possible. The entire engine unit can be completely finished and mounted to the fuselage by four bolts and the links in the control system connected.

The gasoline system is designed to be as fool-proof as possible. All control is through a single four-way valve which allows gasoline to be taken from the wing tanks or either of the drains in the gravity tank. There are two drains in the gravity tank; the upper one is for starting the engine, always supplying gasoline to the carbureter without any pumping when this tank is full. The lower drain is a reserve providing twenty minutes' gasoline. Thus, it can be seen that it is impossible to start the engine without having the reserve tank full. Gasoline is forced from the wing tank to the engine by an engine-driven pump which is supplemented by an emergency hand pump operated from the cockpit. All of the engine controls are mounted in the cockpit between the pilot seats in an out-of-the way position yet conveniently accessible to either man.

The boat hull is divided into three water-tight compartments interconnected by water-tight doors. The forward compartment contains marine equipment and additional baggage to that carried in the rear baggage space. The middle compartment has six seats, the forward two of which are provided with dual control—the right side being removable. A single control column in the middle is fitted with an elbow which allows the control wheel to be swung to either side. When the right rudder pedals are removed, there is no protuberance or enlarged opening in the floor. The control wheel is broken into segments to provide better vision of the instrument board. The instrument board is at the left of the cockpit, and on it are mounted Pioneer instruments arranged for night flying. At the right side of the cockpit is the entrance to the bow compartment.

Behind the pilot and in the same room are the four passenger seats. These seats are also like the pilots' seats in that they are of welded steel and comfortably upholstered with cloth corresponding to the upholstery of the cabin. The passenger chairs are somewhat lower and more reclining than the pilots' chairs, making them very comfortable. Safety belts are fitted to all six chairs and in turn all six chairs are rigidly attached to the floor. This chair attachment at the floor is such that the chairs can be removed quickly with little effort and no tools. Life preservers are contained in the seat cushions and are quickly accessible by means of a zipper fastener. In the back of all chairs, pockets are provided wherein the passengers can place small objects.

The walls of the cabin are covered attractively with cord, the ceiling above the windows in light colors, and then from the windows to the floor, dark. Wherever it may become necessary to remove the cloth for inspecting the boat, provision is made that it can be removed easily.



Pratt & Whitney-powered Heinkel Amphibion ashore

The window are provided with silk curtains, rolling up automatically. Two lamps on the ceiling of the cabin and one lamp each in the lavatory and the bow compartment are provided. The cabin is equipped further with exit steps, electric cigar lighters, ash trays and fastener for anchoring the baggage. The plywood floor is covered with a dark Bouclé carpet. The floor is designed so that it can be quickly removed for inspection of the boat bottom. The entire middle floor panel between the passenger chairs is quickly removable to allow inspection of the control system. No tools are required to remove this panel.

The usual lavatory consists of the toilet with bucket, which can be taken out, wash basin with drain and water tank, towel holder and mirror.

The floor of the bow compartment is of the lattice type, being very light and easy to remove and yet draining any water from the marine equipment such as drifting anchor, ground anchor or the line which is stored here. In the bow compartment are also straps, etc., for fastening the baggage, thus preventing it from shifting during flight.

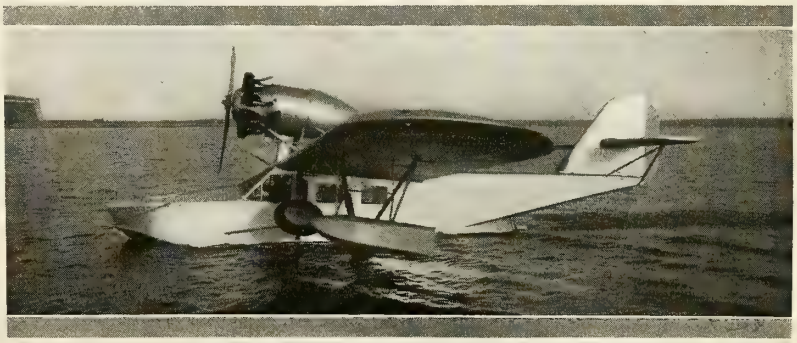
The boat hull shape is the result of Heinkel's many years' experience in seaplane and flying boat design. The original boat form was tested in the water channel in Hamburg, the largest in the world. After the experience was gained with the first boat, the production design of the second plane was finally decided upon. It might be called a two-step design with the second step tapering in plan view to a V, or it might be called a single-float design with the tail supported by a single semi-monocoque beam. Forward of the front step, the bottom is a concave V-section with a definite downward curve at the chine. This concavity decreases towards the bow, where the bottom has a straight V with no concavity. Between the first and second steps the bottom has a pronounced straight V. The second step ends in a combination water rudder and tail skid. Behind the rear step the bottom has a slight V.

The sides of the boat are vertical throughout, and the deck is well rounded for aerodynamic and seaworthiness reasons. Rubbing strips are provided on those portions of the deck where one needs to walk.

Structurally, the boat is a semi-monoque structure which utilizes the skin to take part of the load. The bulkheads are open frames connected by four longerons made up of dural sheet bent into an angle to conform with the boat shape. The skin is flat throughout, no corrugated or ribbed sheet being used in the entire airplane.

The wing floats are similar to the boat in construction, being of semi-monocoque design divided into three water-tight compartments. The floats are braced to the wing struts and to the wing with steel and dural tubes arranged to utilize the wing bracing to the best advantage,

(*Continued on following page*)



The Heinkel Amphibion afloat, with wheels retracted



Direct front and side views of the German Heinkel HE-57 Amphibion at rest on the ground

(*Continued from preceding page*)

both aerodynamically and structurally.

The tail surfaces are of dural with fabric covering attached in the same way as the fabric is attached to the wings. The movable tail surfaces, like the ailerons, are made up of stamped sheet ribs with flanged lightening holes. The spars are tubes of duralumin to which the ribs are riveted. The fixed tail surfaces have spars of C-section dural made from flat sheet stock. The horizontal stabilizer is quite interesting in that the front and read spars are interconnected with C-section dural members, with the webs lightened with flanged holes. These members are arranged in a Warren truss in plan view, and have the elevator hinges where the truss members meet the rear spar. The stabilizer ribs are made in parts. The nose is stamped as a unit and riveted to the flanges of the C-section front spar. The spar opens forward. The middle portion of the ribs is U-section, with the U on its side and riveted to the spars and to the inter-spar bracing. There is no trussing between the upper and lower U's of the ribs.

The fin is similar to the stabilizer except that rigid reinforcement was necessary to provide a foundation for the high stabilizer.

The question of dural covering for dural structures was studied quite thoroughly before it was decided to use fabric covering. By having the fabric easily replaced much cheaper than by the usual sewing method, it is a great advantage to be able periodically to inspect and preserve the internal structure.

The second plane has undergone considerable testing in the air, on land and water. Stability tests have been made with every possible combination of load. For a high engine design, it is said that the longitudinal stability is exceptional. This is attributable mainly to the canted engine axis and negative angle of the stabilizer. The length and area of the tail was determined so that the slipstream action on the tail always balances the moment of the high engine thrust in such a way that when the throttle is retarded the plane automatically goes into a glide.

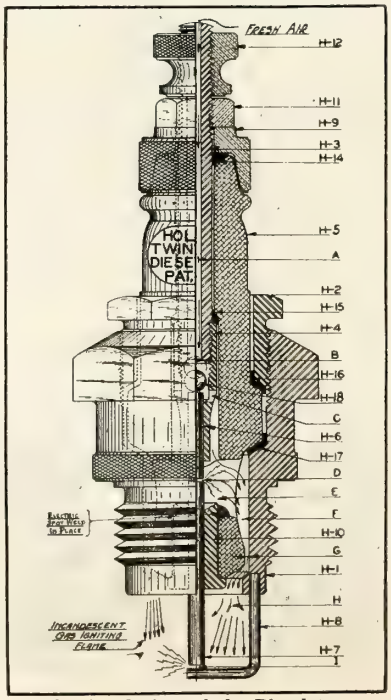
Specifications

Span	52 feet 6 inches
Length overall	37 feet 5 inches
Overall height	13 feet 10 inches
Wing area	422 square feet
Weight empty	3,800 pounds
Useful load	1,729 pounds
Gross weight	5,539 pounds
High speed (without ring cowl)—	118 miles per hour
Cruising speed	100 miles per hour
Landing speed (actually measured photographically)	57 miles per hour
Time to lower landing gear	15 seconds
Time to raise landing gear	60 seconds

THE TWIN SHOT DIESELATOR

THE Twin Shot Dieselator, recently patented by E. R. Holmes, automotive and aeronautical engineer of Denver, Colo., is designed to produce a capable ignition system whereby Diesel engine performance is obtained in gasoline engines, especially automobile, airplane and motor boat engines.

The Dieselator projects intensive ignition into a gaseous body at widely separated points within the engine cylinder to obtain complete combustion of the fuel used. It produces dual ignition with only one timer and one distributor. At the proper moment, two intensified balls of electric flame, each several times larger and hotter than a single spark, occur simultaneously at widely separated points within the cylinder. According to Mr. Holmes, any carbon, oil or other substances that collect at the electrode gap are consumed, eliminating the dangers of fouling or shorting. The effective pressure upon the piston is governed by the speed of the gas combustion. The faster the gas burns, the higher the pressure upon the piston. By igniting the gas at the two well separated locations, the speed of the combustion, is doubled. The faster the combustion is, the more complete it will be, resulting in less deposits, Mr. Holmes asserts.



Sectional view of the Dieselator

In the center of the Dieselator body is a small detonating chamber into which is drawn a volume of fresh air charged with a portion of fuel from the cylinder. Then, by reason of its consistent shape, it is pointed out, high compression is created, the gaseous mixture therein being extremely volatile and highly explosive. The mechanism is designed so that automotive ignition occurs at the predetermined instant; the intensely hot, incandescent gas flame blast is shot into the heart of the main gas body. Consequently, either independently or in conjunction with the primary ignition, the secondary ignition becomes sure fire regardless of the grade of fuel used, according to the sponsors of the Dieselator.

In outlining the principal advantages of this new instrument, as compared to the electrical system now in use by the various gasoline, Mr. Holmes said as follows:

"Through the foregoing principles of gas compression and automotive ignition, the stability and surety of the Diesel engine is perpetuated and brought to every airplane, automobile and motor boat without the extra expense and extra engine weight. The Dieselator merely replaces the spark plug, one to each cylinder, attaching ignition cables in their regular positions."

Test runs made by automobiles equipped with the Dieselator show an increased mileage ranging from thirty to forty per cent with a power increase ranging from ten to fifteen per cent.

Multi-Engine Switches

AMONG the products developed by the Delco Aviation Corporation, Dayton, Ohio, subsidiary of Bendix Aviation Corporation, are ignition switches for planes powered with two or more engines. This type of switch combines the ignition control in one compact housing and has an individual lever for controlling each engine. By means of a master switch provided in the same housing all the ignition may be cut off by flipping a single toggle lever.



Trade Mark 'TABLOID' Brand FIRST-AID No. 714 (Pocket Kit)
Reduced Facsimile
Kit Measurements: 4 x 2½ x ⅞ in.

Trade Mark 'VAPOROLE' Brand
Aromatic Ammonia
(FOR USE AS SMELLING SALTS)

Actual Size

'Tabloid' First-Aid is furnished in all types and sizes and thus adapted for every possible emergency.

Trade Mark 'CAROFAX' Brand
Carron Oil (Solidified)
(CONTAINING 2% PHENOL)

Reduced Facsimile

Extremely Important Factors in Emergencies

Every item in *every* type of equipment will be found invaluable at *some* time of emergency. Two important items standard with all 'Tabloid' First-Aid are:—

TRADE MARK 'TABLOID' BRAND FIRST-AID

Trade Mark 'VAPOROLE' Brand
AROMATIC AMMONIA
(For Use as Smelling Salts)

A delicately perfumed aromatic ammonia for inhalation in case of fainting, gas poisoning, or collapse.

	List Price
Box of 12	$ .60
Box of 100	4.75
Box of 1,000	45.00
Packing of 3—Carton of 12	2.00

Subject to Trade Discounts

Trade Mark 'CAROFAX' Brand
(Carron Oil, Solidified, with 2% Phenol)

Ready for instant use as an application for the treatment of burns and scalds.

	List Price
Collapsible tube ¼ oz.	$ .12
Collapsible tube ¾ oz.	.25
Collapsible tube 4 oz.	.60
Collapsible tube 4 oz., per 100 tubes	55.00
Jars—1 lb.	2.00

Subject to Trade Discounts

TRADE MARK 'TABLOID' BRAND
First-Aid No. 714
(Pocket Kit)

Standard List of Contents

2—'Vaporole' Aromatic Ammonia
2—'Vaporole' Iodine
1—'Tabloid' Bandage Compress
2—'Tabloid' Adhesive Compress
1—Tube of 'Borofax' (Boric Acid Ointment)
1—Adhesive Plaster, ½ in. x 1 yd.
1—'Tabloid' Bandage (Open Wove, 2½ in. x 3 yd.)
1—Tube of 'Carofax' (Carron Oil Solidified, with 2% Phenol)
1—Direction Card

List Price $1.00

Subject to Trade Discounts

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9 & 11 EAST FORTY-FIRST STREET, NEW YORK

Associated Houses:

LONDON MONTREAL SYDNEY CAPE TOWN MILAN
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"Keep your 'Tabloid' First-Aid complete by maintaining a reserve supply of refills."

Burroughs Wellcome & Co. (U.S.A.) Inc. A. D.
9 & 11 East 41st Street, New York, N. Y.
Enclosed is One Dollar ($1.00) for new instructive and educational 'Tabloid' First-Aid Manual.

Name .....

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RECENT AIRCRAFT PATENTS

THE following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N. W., Washington, D. C., at the rate of 20c. each. State number of patent and name of inventor when ordering.

Appliance for airplane launching track. Ernst Heinkel, Warnemunde, Germany (1,798,881).

Aircraft, submarine, or other totally-immersed craft or structures. Albert P. Thurston, London, England (1,798,913).

Aircraft. Albert P. Thurston, London, England (1,798,914).

Aircraft. Albert P. Thurston, London, England (1,798,915).

Starting device for flying machines. Ernst Heinkel, Warnemunde, Germany (1,798,940).

Airplane motor and propeller mounting and adjusting means. James F. Connor, Cleveland, Ohio (1,799,005).

Aeroplane. Gianni Caproni, Rome, Italy (1,799,088).

Aeroplane radiator. Marcel Lobelle, Hayes, England (1,799,107).

Propeller. Richard Schallert, New York, N. Y. (1,799,192).

Automatic control for landing airplanes. Peter R. Schneeweiss, Cleveland, and John H. Leonard, Lakewood, Ohio; said Leonard assignor to said Schneeweiss (1,799,194).

Radio directing-finding means for airplanes. August Leib, Berlin, Germany (1,799,238).

Landing-light for airplanes and the like. Charles W. Dake, Chicago, Ill., assignor to Pyle-National Co., same place (1,799,285).

Landing-light for airplanes and the like. Charles W. Dake, Chicago, Ill., assignor to Pyle-National Co., same place (1,799,286).

Device for airplane-launching apparatus. Ernst Heinkel, Warnemunde, Germany (1,799,366).

Parachute and launching apparatus therefor. Matthew S. Kelley, New York, N.Y. (1,799,376).

Aeroplane-engine. Hugo Blidsoe, North Plainfield, N. J. (1,799,498).

Reversible-blade propeller. George C. Elmore, Pierce, Fla. (1,799,548).

Flying boat and like craft. Leroy R. Grumman, Port Washington, N. Y. (1,799,555).

Mooring for airships. Francis H. Clergue, Montreal, P. Q., Canada (1,799,677).

Aeroplane. George Crompton, Jr., Worcester, Mass. (1,799,733).

Airplane propeller-blade. Charles H. Gunn, San Mateo, Calif., assignor to Aircraft Specialties Co., same place (1,799,745).

Airplane. Vincent J. Burnelli, New York, N. Y. (1,799,777).

Airplane. Vincent J. Burnelli, New York, N. Y., assignor to Uppercu-Burnelli Corporation (1,799,778).

Propeller-control mechanism. Ernest G. McCauley, Dayton, Ohio assignor to Standard Steel Propeller Corporation (1,799,828).

Flying-machine structure. Claudius Dornier, Friedrichshafen-on-the-Bodensee, Germany (1,799,889).

Apparatus for training in aviation. Burdette S. Graham, Norman, Okla., and William C. Morris, Concord, N. C. (1,799,895).

Airplane. Herman Klingaman, Louisville, Ohio (1,799,910).

Propeller-mounting. Roy F. Muehlenbruck, Hampton, Iowa (1,800,094).

Propeller. Karl F. Starz, Elizabeth, N. J. (1,800,112).

Boiler installation on steam-turbine plants for aircraft. Rudolf Wagner, Hamburg, Germany (1,800,124).

Aeroplane. Humberto R. Villarreal, New York, N. Y. (No. 1,800,164).

Seaplane-float construction. James L. Bernard, Toledo, Ohio (1,800,167).

Nonrigid airship. Kurt Bauch and Paul Helma, Akron, Ohio, assignors to Goodyear-Zeppelin Corporation, same place (1,800,174).

Headlight for aircraft and the like. Carl H. Larson, Elkhart, Ind., assignor to Adlake Co. (1,800,301).

Blade of screw propellers. Franz Melcher and Ernst Schneider, Vienna, Austria (1,800,313).

Airplane. Walter Darbyson, Windsor, Ontario (1,800,439).

Propelling mechanism. Joseph M. Handley, Orrick, Mo. (1,800,524).

Parachute-release safety device. Benjamin F. Tofflemire, Berkeley, Calif. (1,800,575).

THE PSYCHOLOGY OF THE INVENTOR

By Joseph Rossman

IN a book recently written by Joseph Rossman a true picture is given of the mental life of the inventor, why and how he invents, how he gets his inspiration, whether inventors are born or made, and other absorbing topics. Many facts are gathered that have never appeared in print and many observations of 710 prominent living inventors are quoted.

Some of the important features of this book include the analysis of the mental operations of the inventor in terms of his own reactions and emotions; a description of the actual methods used by inventors; their trials and tribulations; their attitudes and opinions on the material side of inventing; their relation to the promoter and the purchasing public; and their experiences before the Patent Office and in litigation before the courts.

The author, Joseph Rossman, has had a legal, psychological and technical training which aptly fitted him to write this book. He is a Patent Examiner in the U. S. Patent Office where he has made contacts with many inventors. He is a chemical engineer, a member of the bar of the U. S. Supreme Court, and has received his Ph.D. in psychology in the American University. He has written many technical articles and is the editor of the Journal of the Patent Office Society.

Aircraft. Felix Naim, Detroit, Mich. (1,800,744).

Means for controlling aeroplanes. Frederick H. Page, London, England, assignor to Handley Page Limited, same place (1,800,746).

Control means for aeroplanes. John K. Hartman, Pequea, Pa. (1,800,794).

Airplane. Albert Tucker and James S. Van Ausdal, Pensacola, Fla. (1,801,028).

Flying aeroplane-carrier (a mid-air aeroplane landing station). Emil Florig and Alfred Brache, New York, N. Y. (1,801,039).

Floating harbor (for hydroplanes and other vessels). Clarence W. King, Shreveport, La. (1,801,089).

Helicopter. Kenneth J. Yost, Campbellstown, Ohio (1,801,184).

Airship construction. Frederic C. Krummel, Brooklyn, N. Y. (1,801,202).

Winged screw propeller for aircraft. George Anderson, Biggar, Saskatchewan, Canada (1,801,216).

Flying wing. William W. Christmas, New York, N. Y., assignor to General Development Co., Hartford, Conn. (1,801,331).

Aeroplane. Roger W. Griswold, 2d, Huntington, N. Y. (1,801,344).

Aeroplane. Lawrence R. Loveland, Washington, D. C. (1,801,356).

Flying machine. James J. Fitzgerald, New York, N. Y. (1,801,418).

Fluid tank. Charles A. Van Dusen, Cleveland, Ohio, assignor to Glenn L. Martin Co., same place (1,801,468).

Propeller-hub. Frank W. Caldwell, Dayton, Ohio, assignor to Hamilton Standard Propeller Corporation (1,801,486).

Propeller-hub. Daniel G. Lilley, Denver, Colo. (1,801,511).

Aerial propeller. John F. Cook, Jr., Detroit, Mich. (1,801,725).

Aircraft. Auguste J. F. de Bavay, Kew, Australia (1,801,727).

Airplane. Sherman T. Allen, Beverly Hills, Calif. (1,801,833).

Aircraft. Sherman T. Allen, Beverly Hills, Calif. (1,801,834).

Safety means for aircraft. Reuben A. MacLean, Ottawa, Canada (1,801,871).

Apparatus for the diagonal control of moving objects, particularly aeroplanes. Johann M. Boykow, Berlin-Lichterfelde, Germany (1,801,947).

Automatic steering and stabilizing apparatus. Johann M. Boykow, Berlin-Lichterfelde, Germany (1,801,948).

Landing of airships. Otto Krell, Berlin-Dahlem, Germany (1,802,025).

Airplane control. Charles A. Van Dusen, Cleveland, Ohio, assignor to Glenn L. Martin Co., same place (1,802,130).

Airplane. Eilet M. Torkelson, Elizabeth, N. J. (1,802,226).

Rudder and brake for airplanes. Marvin L. Cozart, Colorado Springs, Colo. (1,802,238).

Landing or dispatching device for aeroplanes. Lionel Holland, Calcutta, India (1,802,254).

Aeroplane-wing. Oliver E. Simmonds, Holmfels, Woolston, England (1,802.283).

Landing-gear for aeroplanes. William LeR. Williams, Seminole, Okla. (1,802,299).

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Woodruff De Silva
Assistant
Director of Airports
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PERSONAIRLITIES



IF you are even an occasional member of the great movie audience—and who isn't—and if you have seen any of the flying pictures, you've doubtless seen Pilot Earl H. Robinson in action. He holds a commission in the California National Guard Air Corps, where he commands the 115th Photo Section. Last fall he led a flight of three National Guard planes on an 8,000 mile tour of the United States, from Los Angeles to Boston to attend the American Legion convention, and return. He has had over 2,000 hours in the air, much of it in the motion picture business. His comments on the hours of some movie pilots will be of interest to many of the boys who fly over the studios of the West Coast.

This "hour" business, by the way, was one of the few major industries that suffered no loss during the depression. For instance, I happen to have the year-old biography of a pilot who declared he then had 1,000 hours. He only learned to fly in 1929. He was in my office last week, and I was asking him a few questions. It seems he hasn't flown, except very occasionally, for the past year—yet his hours, he told me, were now about 2,500. That "about" is certainly an elastic word. Hours in the air resemble whiskers—they grow without any effort or cultivation on the part of the happy owner. Here's what Earl Robinson has to say of them and their growth in the salubrious climate of California:



Earl H. Robinson

"Let me call your attention to something with which no doubt you already are acquainted. Motion picture aviators differ somewhat from other fliers in that they are not quite so reticent in speaking of themselves as are most other pilots. As a matter of fact, they may be placed in very much the same category as actors; both are notorious liars, the one about their salaries, the other about their hours in the air."

Robbie, I don't think this merry practice is confined only to the boys flying for the movies; I've come to the conclusion that it's a pretty general habit, harmless and amusing. And usually the pilot isn't fooling anyone but himself. So everybody's happy, all 'round. Here's Robinson's history, very kindly written for me by himself:

"During the war I served my country by participating in the battle of Great Lakes, at the Naval Station just north of what is now Curtiss-Reynolds Airport. Returning to school after the cessation of hostilities, it was quite some time before I became interested in flying. The Pulitzer Races in St. Louis in 1923 gave me my first opportunity of close observation of aviation. Interested though I was, it was not until July, 1924, that I had my first flight. Had my first ride Sunday and had soloed within the week.

"Staggering around Lambert Field through 1924 and 1925, I managed to get in quite a lot of flying time. In September, 1925, I was appointed a Flying Cadet and departed for San Antonio, Texas, where I took the Primary and Advanced courses, graduating in September, 1926.

"Just prior to my graduation, Paramount Pictures Company arrived at Kelly Field to commence the filming of "Wings." Here was my golden opportunity (thought me), so immediately upon graduating, I resigned and pestered the assistant director into giving me a job. This job consisted of dressing dummies at the magnificent pay of five dollars a day. Through many trials, some comical, others sad, and several damn near fatal, I managed to become Bill Wellman's chief aeronautical assistant. Upon completing the flying scenes in Texas, I accompanied the troupe back to Hollywood to begin in earnest my conquering of the world's fourth largest industry. To date the only part it has been possible to attain are a few blondes, and they not for long.

"With the successful opening of 'Wings,' I felt my future was assured and sat back to await the rush for my services which I knew would be forthcoming.

"It soon became evident that if I wanted to work again, it would be necessary for me to convince someone of my great abilities. This I found rather difficult because of the fact that most everywhere I went I found that at least three people had preceded me, all claiming to have been the chief aeronautical assistant on the picture. I have, of course, since learned the art of cutting throats, which seems to be the only way to sell yourself to these picture executives.

"There are, however, about five of us in the business who are honest with each other and manage to work with and for each other without the necessity of resorting to underhanded methods. So much for that.

"During the three and one-half years that I have been here I have worked in some capacity, aeronautical supervisor, chief pilot, camera pilot, stunt pilot, flying director, scenario collaborator, even acting, on practically every air picture that has been made in that time, with the exception of 'Hell's Angels.'

"I usually fly the camera. The camera is rigidly mounted at the desired position on the plane and run by an electric motor, which is operated by storage batteries. This I can control from the cockpit by an electric switch mounted on the stick. Most of the aerial action can be photographed in this manner, including the close-ups of the actors (if they fly) and the background action for process close-ups (if they don't fly.)

"While filming a scene in 'The Dawn Patrol,' which showed the straffing of an enemy airdrome, an excited powder man set a sixty-stick charge of dynamite off just as I passed over at a twenty-foot altitude. Blew most of the fabric loose and bent the propeller. That furnished my nearest accident in the picture business.

"That day's flying called for the straffing of a German airdrome—and the opening scene was a long dive by two ships in formation. Distributed about the field in various places were charges of dynamite, these to be set off at intervals to simulate the falling bombs of the two attacking planes.

"It can readily be seen that the timing of these explosions is of great importance and that it behooves the pilot to ascertain that the man in charge of the explosions knows his business. Usually this individual is the 'Powder Man,' who has considerable experience in the handling of explosives of all kinds. Not a great many of them have had much experience in flying pictures, however, and for that reason the job is sometimes delegated to another pilot on the ground.

"While going over the scene with the director, I suggested that the man for the job was the technical engineer (Harry Reynolds) who had performed a like service on three other pictures with me. The director informed me that he had a very good powder man and that out of deference to him he disliked giving the responsibility to someone else. I argued that a powder man's feelings meant nothing to me as compared to my neck, but to no avail—and it was finally agreed that the director was to have his way.

"The actors, cameramen, director and his assistants, and all of the various and sundry people that go to make up a motion picture troupe, took up their allotted places, while the other pilot and myself took to the air to await the signal to start the dive. We were both equipped with a short-wave radio set in the ship which enabled the director

(*Continued on next page*)



What About the TUBING?



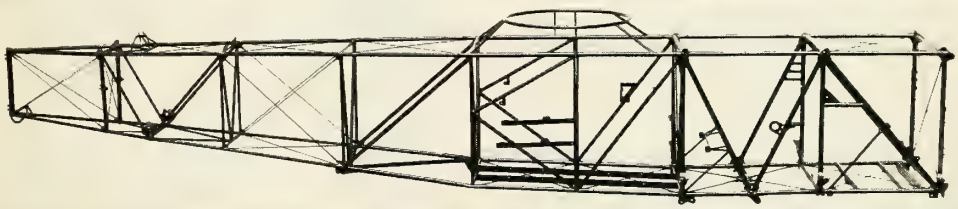
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(*PersonAIRlities continued*)

constantly to keep in touch with us. We were to start from a position about a quarter of a mile away and an altitude of 2,000 feet, dive at the line of planes in front of the hangars, and flatten out about fifteen feet above the ships. One of the planes on the line was loaded with sixty sticks of dynamite and was to be blown up just as soon as my tail cleared it (I was second in the formation.) The last part of the dive was directly toward the cameras. Upon passing over the cameras, we both were to zoom and make wingovers and back into the scene, from different angles.

"We cruised around for several minutes, until at last we got word to come on in. Rolling over into a turning dive and at last starting to straighten out for the cameras, my thoughts couldn't help but go to those sixty sticks of dynamite and the man who was controlling them. There was not much time for thinking, however, as we were soon doing better than two hundred miles per hour. Flattening out about ten feet above the first ship I knew it wouldn't be long now—as the fourth ship was the loaded one.

"Next thing I knew, there was a terrific explosion, a violent shock, a lot of dirt in my face and I was about seventy-five feet in the air and on my way up damn fast! Reaching the peak of my zoom at about 1,500 feet, I found the motor was vibrating badly, so I idled it immediately. The four wing panels were all either ripped from the concussion or from flying debris. I tried the controls and estimated the gliding speed to be sufficiently low so as to allow me to land without cracking up. I had a 'chute which I could have used but decided against it.

"I landed fairly hot and taxied up to the line, where I was met by the powder man and the director, both scared to death. Finding that I was uninjured, one disappeared, and the other went around behind the hangar and became violently sick to his stomach.

"So, for the sake of one powder man's reputation, we damn near killed one aviator, one director, two assistant directors, two cameramen and possibly five or six other people."

A still photographer caught this explosion with a Graflex, and if our cut is clear, you may see the strut from the blown-up plane on its way up to hit the propeller of Robinson's ship; also the electric wire that set off the explosion, trailing down to the left of the rising column of dirt. The wing of the destroyed plane, which you see rising, went up a little further and was knocked down by the landing-gear of Robinson's ship as it sped past. I have never seen a more remarkable picture. It quite resigns me to not being in the movies.



Real hazard in the filming of "The Dawn Patrol"—Robinson flies into the explosion

You know, some twelve years ago, after I had seen that first picture of Locklear's, I got a great bug to go in the movies myself, and was seriously considering going to Hollywood on the off chance that I could hook up as a stunt pilot. This, of course, was when I was fairly young and full of ambition to do things. I shudder to think that I might have found myself posing for my picture immediately above an explosion, or been snapped in the act of colliding with another bold pilot, merely that a movie magnate much smarter than myself might profit financially from my boldness. You can observe the disastrous effects this close call had on our friend Robbie—he had started to grow a moustache, but the shock of that explosion stunted it. I doubt if it will ever amount to anything now.

NOW, folks, this tough looking officer with his eyes almost closed, looking at the sun, is Flying Officer Gilbert Jenkins of the Royal Canadian Air Force. He's up in good old Canada, though he isn't in what you'd call one of the really good parts of good old Canada. He's at Camp Borden, and not even the most patriotic Canadian pilot was ever heard to wax enthusiastic about Camp Borden. It's just a field, somewhere between 100 and 1,000 miles north of Eaton's store, which is the exact center of population in Canada. Stand in Eaton's long enough, and every living soul in Canada — including some of the dead ones in Nova Scotia — will come in that store to get a catalogue to take home and hang out back.



Flying Officer Jenkins

And Camp Borden is somewhere north of this great store. Before the war it was a territory where the farmers couldn't raise anything but dust, so they turned it into a flying field. I suppose they've made it into quite a place by this time; but during the war the conditions there were so tough that the boys found even the war was an improvement. The Canadians trained on it only in summer, and in winter went down to Texas, giving Camp Borden back to the Indians, who were always relieved to turn it back to the Flying Corps in the summer. The pilots would have been glad to leave it with the Indians the year 'round, but it was one of those things the government had bought from some of its intimate pals in the hurry and confusion of the war, so it had to be used. They say the ghost of Sam Hughes still may be heard there, moaning softly, on dark nights.

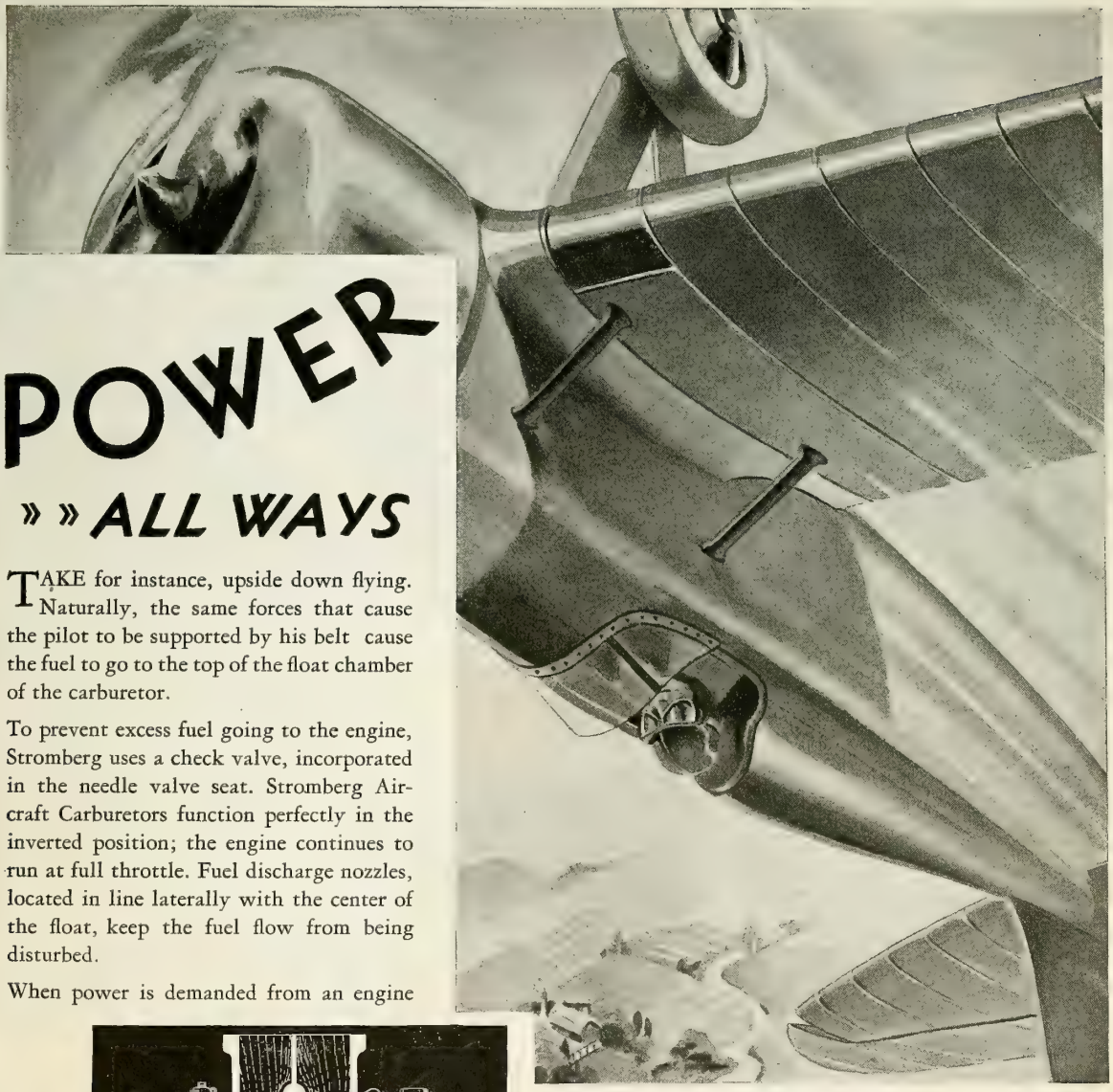
And that's where my old friend Jenkins is marooned as an instructor of the rising generation of Canadians. He's as cast away there as he used to be every now and then in that desert between Port au Prince, Haiti, and Barahona, Dominican Republic, where he used to fly a Waco powered with the oldest OX5 then in existence. It would run just long enough to get him well away from civilization—as civilization is reckoned in those parts—and then it would give a tired grunt and stop. He'd get to work and fix it so it would hop to the next piece of desert, and then it would lie down again. Jenkins got so he knew every lizard between Barahona and Port au Prince. His life was just one forced landing after another.

He finally solved the problem by putting the OX in the Marines' repair shop at Port au Prince, where he took it apart and happily mislaid most of it. He spent the next two months looking at it and pretending to wonder how it went together. Whenever Basil Rowe, who was chief pilot of the musical comedy airline that Jenkins was supposed to be flying and walking for, dropped in, Jenkins would grab a hammer and pound on the crankshaft to prove that he was interested in his work. He was employed thus for two months before the company solved his problem and their own by handing him a ticket to New York, by boat. They handed me a similar ticket a month later, thus solving two more problems—mine and theirs. No tears were shed on either side. Roscoe I. Dunten, Basil Rowe and Bill Wade stuck it out like heroes until the old West Indian Aerial Express was taken over by Pan American, so now everybody's happy.

And that's where it was I met Jenkins. He had learned to fly in the Royal Australian Air Force in 1925—since which he has flown about thirty different types of planes in six different countries. After the Dominican disaster—by which term I refer to his succession of struggles with that OX-5 and a sugar planter turned airline operator—he went to Canada and got a commission in the R. C. A. F. He went on forest patrols in Alberta, flying over the Crow's Nest Reserve in the Rockies—oddly enough, another of my old stamping grounds, back in 1920. Then he went to Vancouver on flying boats and seaplanes, from which he was transferred to Camp Borden, where he's stuck fast.

He happens to be a good instructor, I understand, and good instructors have no chance of leaving Borden. They just keep them there until they become petrified, when they stand them up around the field as boundary markers. His address, in case his old friends see this and want to write to him, is: Officers Mess, R. C. A. F. Station, Camp Borden, Ontario. He'll probably be there until the next war. His life's labors may be summed up by a paraphrase of the Air Force slogan: "Per ardua ad Borden."

(*Continued on next page*)



POWER
» » ALL WAYS

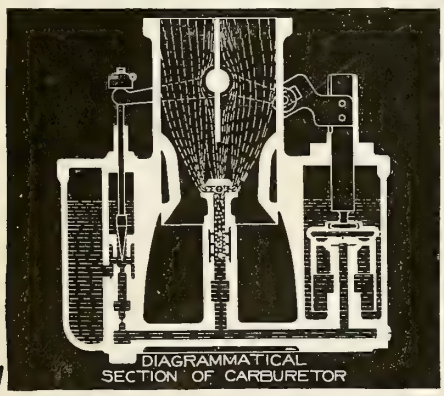
TAKE for instance, upside down flying. Naturally, the same forces that cause the pilot to be supported by his belt cause the fuel to go to the top of the float chamber of the carburetor.

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(PersonAIRlities continued)

I AM indebted to Miss Zelma Crosson for a biography of her brother Joe, the famous Alaskan pilot who has made aviation history flying over the land of vast white silence. I met Joe at Detroit in the summer of 1929, when he came to meet his sister Marvel, whom I had flown across Lake Erie from Cleveland that day. Joe was a quiet, unassuming young man, far removed from the public's conception of what such an adventurous pilot should be. He looked rather like a very polite and obliging bank clerk. Marvel had flown over to see him shortly before returning to San Diego to start the flight to Cleveland that was to end so tragically, and they were very happy. Joe was so proud of his charming and lovely sister whom he had taught to fly, and well he might be, for Marvel Crosson was one of the most gracious and kindly young ladies it has been my pleasure to meet. Her passing was a sad loss not only to her family, but to her host of friends.



Joe Crosson

Well, here's Joe's history, written by his sister Zelma, who has been too brief. I wish you had given us details of his Alaska flying, young lady, for they would be very interesting. "Joe was first bitten by the flying bug when the family spent a winter in California. Coming from a part of the Middle West where airplanes and aviators were only read about, Joe was greatly impressed by the sight of the Nieuports, Jennies and N-9's that were so popular in San Diego aviation circles back in 1919. He managed to save enough money to have a fifteen-minute hop over San Diego, and from then on he lived in hopes. He returned to the Middle West, and it wasn't until 1923 that Joe got his chance really to fly.

"Working industriously in a garage mornings and evenings, Joe, with the assistance of Marvel, saved enough to take instruction from an ex-Army instructor who happened to be around 'Dutch Flats,' now Ryan's Airport at San Diego. Between times Joe collected pieces of N-9's, Jennies, etc., from various junk dealers about town who had contracts to remove all used parts from North Island. Each piece was a cherished object, and it was a happy boy who finally gazed upon the assembled parts and saw his own plane materialized.

"Finishing his instruction in his own ship in June, 1923, Joe began teaching Marvel and flying passengers on Sundays and holidays to finance the up-keep of the plane.

"For the next year and a half both Joe and Marvel became well known in local circles and everyone waited expectantly to see their home-assembled job fall apart. How disappointed the neighbors all were! The ship proved very airworthy and in that time had not so much as a scratched wingtip.

"Passenger hopping and instructing were poor pay, and Joe had to continue working at the garage until Lady Luck smiled his way. Out of a clear sky came an offer to fly in Alaska, carrying passengers and freight throughout the northwestern and central sections of the territory. Did he go? On the very next boat he was Alaska-bound. From the spring of 1926 until late fall Joe helped to make aviation history in Alaska. It was there he met Ben Eielson and Sir Hubert Wilkins, who later asked him to accompany them on their Antarctic Expedition in 1928.

"After a summer around Detroit and Cleveland Joe returned again to Alaska, and during the winter of 1930, spent many long and difficult hours flying in Siberia and northwestern Alaska. He has spent many adventurous hours in the air."

EVERY now and then I shove in a picture of some pilot in uniform, just to remind you that they do use these airplanes in warfare. We hear so much about commercial aviation that we tend to forget that there wouldn't be very much of it if there hadn't been a war a few years ago, and if there wasn't a good chance of there being another one a few years hence.

Here's a relic of the last aerial conflict, in the person of one Ham, W. J., who would have brought pleasure and a revived belief in the honesty of human beings to that old cynic, Diogenes — who, you recall, used to walk around Athens with a lighted lantern, looking for an honest man. He finally ran out of oil, and gave up the futile search. However, if he'd lasted until 1931 he'd have found his man in the person of this Ham, who writes:



W. J. Ham

"My first hankering for wings came while standing in the mud in France as an anti-aircraft gunner's spotter, watching old F E 2b's, B E 2e's, and R E 8's sailing around, apparently enjoying themselves. So, I got a transfer to the R. F. C. from the Canadians, and was nearly fully trained when the Armistice was signed."

Such candor is refreshing. Most of the boys who ended the war before they were fully trained are now persuaded that they finished the conflict at least as Flight Commanders, and possibly as Majors commanding squadrons over the lines. I know any number of Captains and Majors today who ended the war as 2nd Loots on probation—and they haven't been in the Service since.

At a house party last winter, for instance, was a gentleman who delighted the other guests with his accounts of thrilling combats over the lines. He had ended up, he said, as commanding officer of the 94th Aero Squadron, taking over command from Captain Eddie Rickenbacker. He would have gone over big but for the fact that in the party was Major Reed M. Chambers, the officer who actually had commanded the squadron—and he'd never seen this bird before! Talk about hard luck! Of all the house parties on Long Island, that Munchausen of the air had to pick out the only one where his story would be discounted 100 per cent.

But, getting back to Mr. Ham, truthful soul—and all credit to him in this day of Imaginary Aces—he says he didn't do any more flying until 1929, when he joined the Brant-Norfolk Aero Club, one of the clubs sponsored by the Canadian Government to encourage civilian flying in Canada. He got interested again, purchased a new Waco, and flew back to Hollywood, California, where he lives.

WHILE waiting for Farm Relief, back in 1927, Clyde Blackwell left his farm at Longmont, Colorado, and took flying instruction with Cloyd Clevenger, then with Alexander Aircraft at Denver. Clyde got back home, found the folks were still awaiting Farm Relief, so put in his time building a hangar on the farm, where he housed his Eaglerock, powered with a Hisso A.

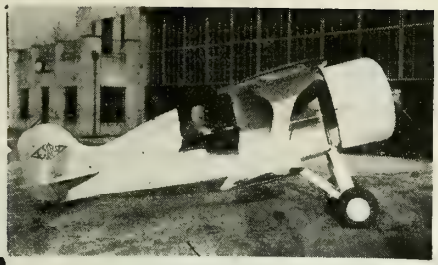


Winifred Blackwell

Still awaiting Farm Relief, Clyde turned a part of the farm into a flying field, so the Republicans bringing the Relief would have a place to land. Well, he sat around, and flew, and attended to irrigation, and cut the hay, and curried the hogs, and so forth, all the time keeping an eye open for Relief. Still it didn't appear, so he taught his sister, Winifred, to fly. Then they both sat there waiting for Federal Aid, which was expected to lease Washington almost any time.

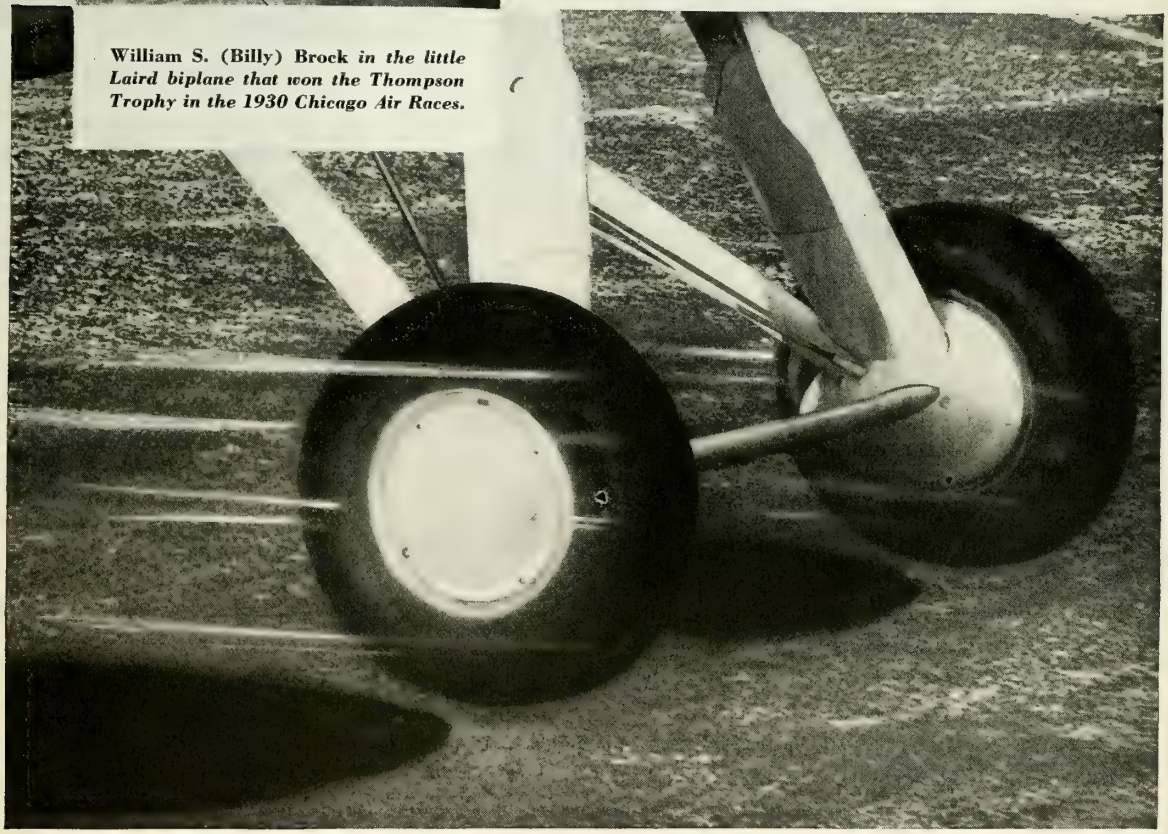
Meanwhile, they got in some more flying, glancing occasionally toward the east. It was during a lesson that Miss Winifred broke into the newspapers, along with two of the farm animals, who also had been longing for Federal assistance and more bushels to the acre.

Clyde and his sister were flying along at 2,000 feet, when he noticed Winifred, who had the controls, acting queerly. She was diving for the field and sort of squirming around in her seat. The faster she wriggled, the faster the ship went toward the ground. Clyde supposed she had sighted a couple of Republican Congressmen heading their way with the expected Relief that the farmers have been promised regularly every four years since 1776. But, no sooner did the plane land than Miss Winifred dived from the cockpit, searched around, and extricated two field mice from her flying costume. In a moment, they were out of aviation, and back on the land.



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William S. (Billy) Brock *in the little Laird biplane that won the Thompson Trophy in the 1930 Chicago Air Races.*



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JOINING THE CATERPILLARS

Brief Accounts of Emergency Jumps Which Won Membership in This Unique Organization

FRED PHILBRICK, of San Luis Obispo, Calif., was testing his plane for spinning qualities when he was precipitated into the ranks of the Caterpillar Club.

His plane, which was locally made, had been successfully test-hopped. He wished, however, to determine whether it would recover properly from a spin. Accordingly, one day in July, 1929, he took it up to 5,000 feet and gave it the test. It spun. When his safety-belt broke, Philbrick was thrown from the plane. Though the plane was demolished, the pilot floated down safely. The following is his account of the experience:

"I climbed to 5,000 feet altitude, closed the throttle and kicked her into a right-hand spin. After spinning two turns, I recovered it. Not satisfied with this one, I kicked her into another right-hand spin and held the stick all the way back. We surely did spin! Being satisfied that she could spin, I tried to bring her out, but something went wrong and I was thrown tight against my safety belt, which held for a moment and then unbuckled. I was thrown with terriffic force out of the plane, striking the upper wing, breaking my goggles in two, cutting my nose and bruising my eye, which closed immediately.



Wells' plane in dive before he jumped with his parachute

"I must have been stunned a bit. First I thought of what an awful fix I was in. Then I realized that I had had my Irvin Air Chute on when I left the ground and wondered whether it was still on me or whether it had stayed with the ship—an impossible occurrence, of course, but nevertheless on looking down and actually feeling it, I experienced tremendous relief. I got a good grip on the ring and pulled it. Then came the jerk. It had opened and I felt just as though I were in a big swing.

"I looked around trying to see the plane but my vision was bad and I could not. By this time I knew I was getting close to the ground but it was just a blur and before I could straighten up for the fall, I landed in sitting position, wrenching my back considerably.

"Observers told me that when I left the ship it turned on its back, made a 180-degree turn and glided to the ground in that position. It was a complete washout."

A HANDFUL of spectators were watching Ted Wells, Travel Air Company project engineer, test a new ship. It was September 10, 1930 at the Central Avenue Airport, Wichita, Kansas. Wells was flying a racing ship of his own design, built in his spare time, and was making a power dive in his little black racer when developments made it necessary for him to abandon his ship. He wore an Irvin Air Service type seat pack chute and though he bailed out at low altitude, escaped with only a broken ankle.

Wells' own account gives a vivid description of his jump: "The ship had the ailerons the whole length of the lower wing, and trailing edge flaps the whole length of the upper wing. I had just leveled the ship off from a power dive at an altitude of about 500 feet and an air speed of about 250 miles per hour, when, for some reason still a mystery to me, the ailerons and trailing edge flaps on both wings parted company from the rest of the airplane at the same instant.

"This, of course, removed all possibility of lateral control, and raised the landing speed to about 100 miles per hour, since the rear 25% of all the wing surface was gone.

"The cockpit was completely closed with a pyralin cover, and I had two safety belts to unfasten. The cockpit cover was held down with two snaps, which required the use of both hands to unsnap. While loosening the safety belts with one hand I endeavored to gain a little altitude while the ship was on an even keel, with no success. Finally, she rolled to the right and started to dive. I let go of the stick and started work on the cockpit cover.



Philbrick before take-off on flight to test his plane for spinning qualities

"The cover jammed after being unfastened, and when I finally got out, the ship was going almost straight down at a terrific rate, and I had about three hundred feet to go. I had difficulty for an instant in finding the rip cord, but when I pulled it, it seemed that the chute opened almost instantly. When the chute opened, I was about as high as some radio towers a hundred feet away—probably between seventy-five and a hundred feet. The ship hit the ground at the same instant as the chute opened.

"The ship was certainly going over two hundred miles per hour when I bailed out and as I had at most three hundred feet when I started fishing for the rip cord, I consider it quite a tribute to the parachute that I got out with only a broken ankle. Probably the chute did not have time to slow me down to its normal rate of descent in the seventy-five feet in which it was open."

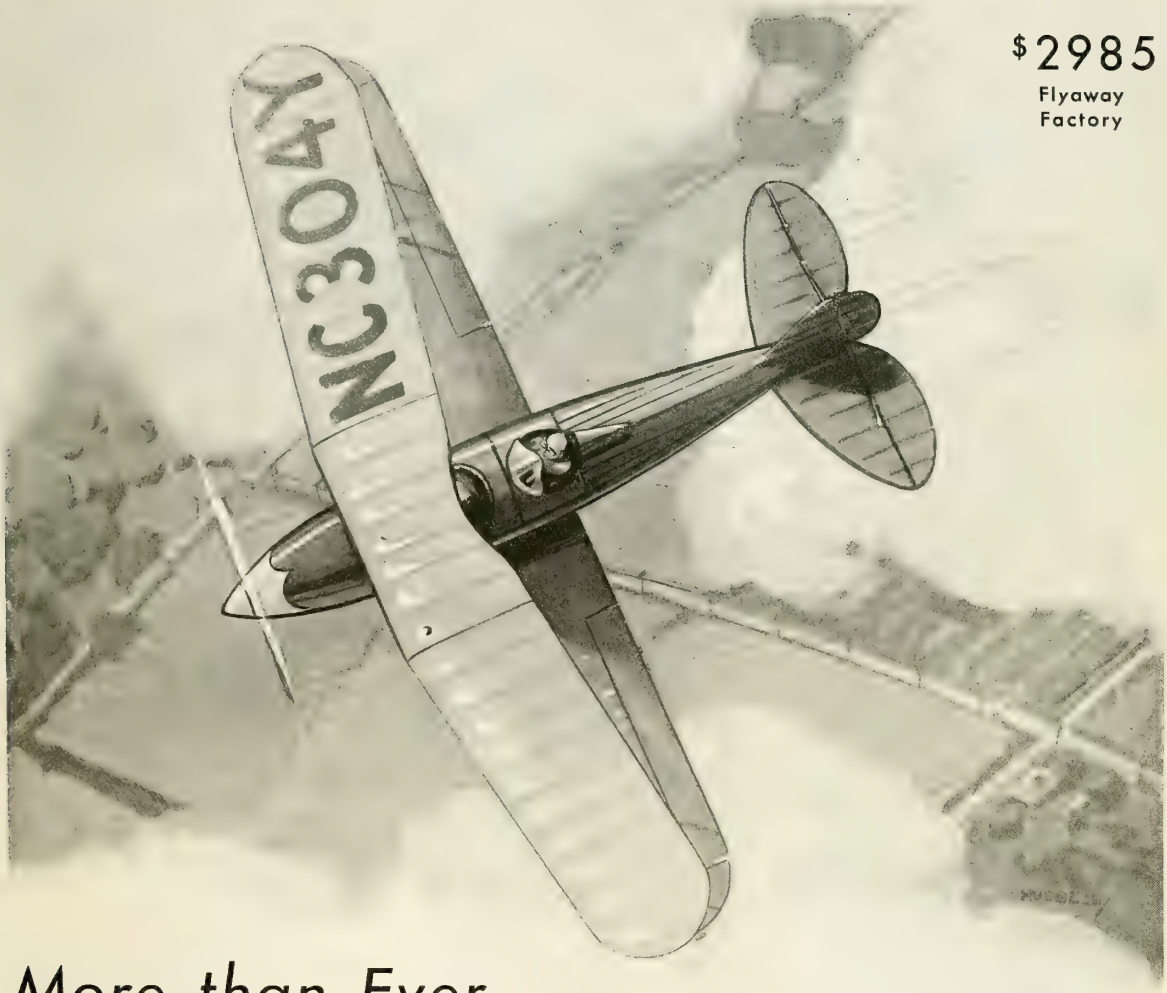
LIEUT. STAFFORD L. LAMBERT, of the Missouri National Guard Air Service, and pilot Herbert Condie, formerly a private in the same organization, were flying over St. Louis, Missouri, on April 12, 1930 when they were suddenly initiated into the Caterpillar Club.

Lieut. Lambert was piloting the plane at about 300 feet altitude, and at an approximate speed of 210 miles an hour, when an aileron flutter developed. Before he could check the speed of the plane to kill the flutter, both ailerons flew off

(*Continued on following page*)

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(*Continued from preceding page*)
the wing. Turning around in his cockpit he shouted to Condie to get ready to jump.

By means of the rudder and the flippers, Lieut. Lambert maneuvered his plane to an altitude of about 1,500 feet, in the meantime loosening his safety belt. "As the ship was not overly stable," he stated, "I decided that it was best that we both leave it. When we reached 1,500 feet, I told Condie to "Go ahead," advising him to make sure he was clear of the ship before he pulled the rip cord ring. He stood up in his seat and, as I held the ship in a stall, he jumped over the side. When I saw him clear the ship, I cut the switches, pulled the emergency fire extinguisher and prepared to jump. As I stood up, the wind pressure threw me out and up against the tail, and I sustained a blow on the back of my head which dazed me for a second or two. The next thing I did was to pull the rip cord ring. Immediately I felt a severe jerk and I found myself sitting upright. I looked for Condie and saw him about 300 feet above me, which convinced me that I must have fallen approximately 600 feet before pulling the rip cord. This impression was later confirmed by witnesses of the accident. I landed in a pig sty while Condie landed in an orchard. Neither one of us was injured, save for a few bruises and scratches.

"The airplane crashed about 60 yards away from us and was completely demolished.'

"Everything happened so quickly that I did not have time to think of what was going to happen. It was not until two days later that I recalled all the incidents connected with the jump, and then they came back to my mind very clearly."

Both Lieut. Lambert and Mr. Condie used the Irvin seat pack chute.

TWO new members qualified for the Caterpillar Club on the afternoon of September 11, 1929, over Langley Field, Va., where they had maneuvered their plane, which had become disabled in flight, in search of a large, clear place to make emergency parachute jumps. The pilots, Lieut. Thomas S. Power, Army Air Corps, and Harry E. R. Hall, private flier, left the plane while it was in a power spin.

They had taken off from Mr. Hall's private flying field at Gloucester, Va. Mr. Hall, owner of the plane, piloted the ship and Lieutenant Power was a passenger in the front cockpit.

"Mr. Hall did a half roll with about 110 miles per hour air speed," Lieutenandt Hall said in his report of the emergency jumps. "We heard a cracking noise and saw the leading edge of the upper right wing collapse. We had about 600 feet when Mr. Hall finally righted the ship and with full gun climbed to 2,500 feet and headed for Langley Field. The fabric kept ripping off on the way over and finally the entire cover came off and the ship fell into a power spin. I bailed out first and then Mr. Hall followed. Both of us had on Irvin Air Chutes and landed without any trouble."

In his description of the incident, Mr. Hall reported that at an altitude of about 2,500 feet he executed a barrel roll, gained speed and then attempted a half roll.

"In the middle of the half roll," Mr. Half said, "the fabric of the upper wing gave way and the ship began to spin. I took it out of the spin at less than 1,000 feet and gained altitude again to 2,500 feet and started for Langley Field for a large, clear place to jump.



"The fabric kept ripping more and more on the way over, and when we got over the field the wing collapsed and the ship went into a power spin. Lieutenant Power jumped and I followed as soon as possible.

"My foot caught while I was getting out and witnesses told me that I did not get clear until the plane was only 600 feet from the ground. I had to take off my shoe to get my foot loose. I pulled the rip cord on the 'chute as soon as I was clear and what a relief when I saw that 'chute open! Right then I wouldn't have traded that 'chute for all of Wall Street. I landed gently on my feet and didn't even roll over. I'll never go up without a parachute."

IN preparation for aerial combat practice with another pilot at 3,300 feet over the Philadelphia Navy Yard on January 11, 1931, Lieut. Alberto H. Santa Maria, Army Air Corps, dived to pick up speed for a climbing turn. When the nose of his plane failed to pull up after repeated efforts with the controls, Lieutenant Santa Maria jumped with his parachute at 700 feet. He landed on top of a crane at the Navy Yard where he remained until helped to the ground by witnesses.

Accompanied by Sgt. C. Brantley as observer, Lieutenant Santa Maria was flying over the Navy Yard when he saw Lieutenant DeCoursey approaching from the direction of Central Airport. He had previously arranged to practice combat with Lieutenant DeCoursey.

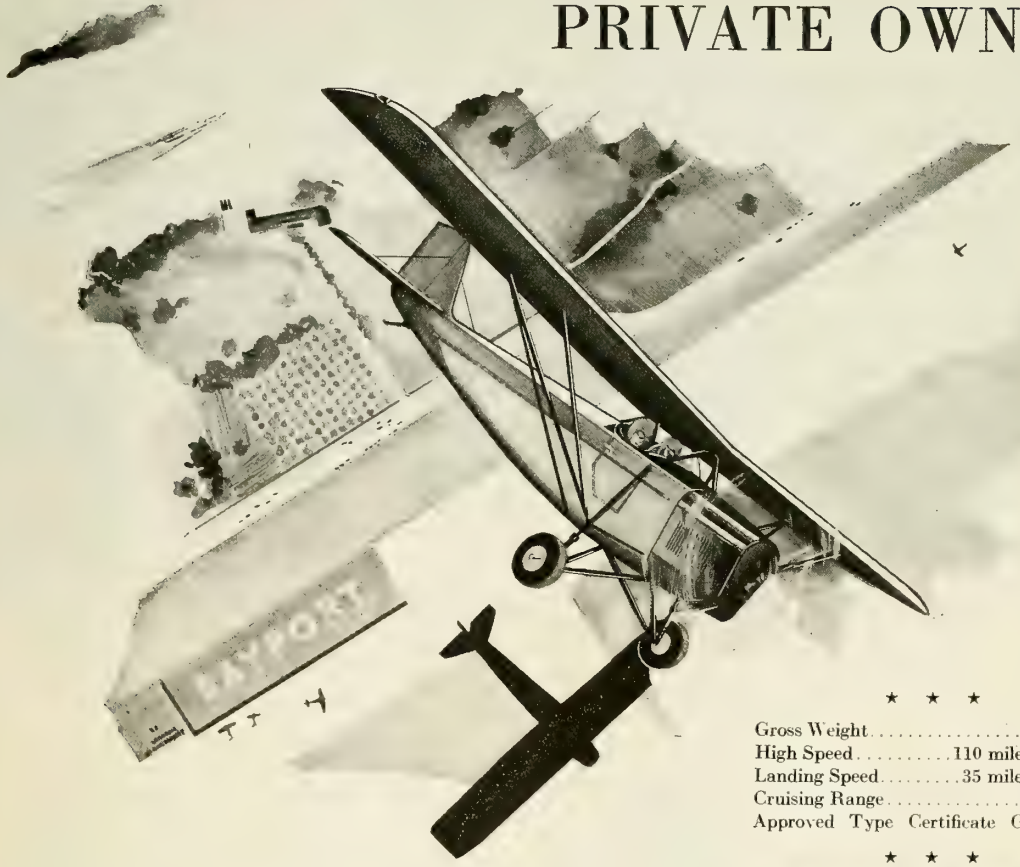
"I turned in the same direction he was flying and started climbing because he had more height than I did and I wanted to let him get in position on my tail before trying to shake him off," Lieutenant Santa Maria stated in his report of the jump. "When I saw he was in this position I banked vertically for a complete turn, then straightened out and reversed my turn. I noticed the other plane was off my tail. I dived to pick up speed, intending to make a climbing turn.

"When I pulled back on the stick the nose did not come up. The plane mushed down as if in a stall. I pushed the stick forward, gave full throttle and tried again to bring the nose up. I looked at my tail surfaces but could see nothing wrong there. I tried to bring the nose up again several times again without success and decided to leave the ship. I crawled out onto the left wing and held on by hooking my left arm in the opening of the front seat cowling and stood with my left leg on the lower wing. With my right hand I motioned to Sergeant Brantley to get out and then reached in and shook him by the shoulder. Motioning him to follow me, I pushed off.

"I reached for my parachute ring. Although the force of the wind made it seem difficult to get my right hand down to the ring, I had no trouble locating it and pulling it out. The 'chute opened the moment I pulled the ring.

"I was falling feet first when I pulled the ring and when the parachute opened it was only a few seconds before I landed to one side of a girder at the top of a Navy Yard crane, about 125 feet from the ground. The wind carried the 'chute over the other side and the force of the wind kept me suspended until help arrived about an hour later. The Irvin Chute was not removed from the crane for a week, but the only damage it sustained was in several of the shroud lines which were rubbed partly through on the girder. For some reason, Sergeant Brantley did not jump or jumped too late. The ring of his 'chute was still in its pocket and had not been pulled."

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OUR READERS AIR THEIR VIEWS

Clarence Chamberlin, noted trans-Atlantic flier, urges the establishment at airports of properly-housed post offices with full postal functions:

"In spite of the significant contribution of 1,113 commercial airports in the United States to the mail service, the establishment of post office services at these ports has been sadly neglected. There is only one airport in the United States which has an office with full post office functions and there is not a single airport with a special post office building.

"With the exception of United Airport at Burbank, California, no airport has any service aside from mail transfer. If you are near an airport and wish to send a letter by air mail, in most cases it will be necessary to drive back into town, purchase your stamp and mail your letter at the nearest post office station. The transfer station located at mail contract airports do not perform the functions of a post office. They are primarily for the purpose of forwarding the mail received at one airport to another. Whatever else they may do is merely an accommodation that they are not obligated to perform. If they happen to be open they may accommodate you with a stamp but they are not equipped to handle registered mail. If you happen to have an air mail stamp, you may drop your letter in the slot in the side of the "shed." But you cannot expect to receive regular post office service.

"The air mail is now thrown into trucks and taken to the nearest post office or borne to the railway and shipped to the nearest town where it finally reaches the post office. There it is segregated and distributed, and often returns part of the way in the direction of the airport at which it arrived before reaching the consignee.

"It is a sad commentary upon our lack of recognition of the dignity of the air mail service, which is destined to become the most important function of the government in the distribution of first class mail matter, that there is not an airport in the United States with a U. S. Post Office Building. Well-equipped private airports by providing post office buildings could offer an inducement to the government to use the field as a mail terminal. It is high time to dignify the airport with proper housing of a government function.

"For some reason the idea of a post office at an airport seems to have escaped notice; at least I have never seen a comment upon its lack. And yet in 1930 airplanes in the United States flew more than fifteen million miles, transporting some 7,500,000 pounds of mail. There are nearly 50,000 miles of airways in operation in this country.

"New York City will have in Floyd Bennett Field, on Jamaica Bay, one of the finest municipal airports in the world. It has been built at a cost of almost five million dollars. This airport has exceptionally good facilities for handling air mail but it should have a branch post office building and should become a mail contract airport."

Miss Aline Rhonie voices a desire to see passenger carrying privileges of private pilots still further restricted:

"Might I be so bold as to stake my views on the licensing of pilots by the Department of Commerce?

"It must be admitted there are too many accidents through carelessness and inexperience. As licenses are granted now, a person is required to have but ten hours solo, with the usual written examinations and flight tests passed to the inspector's satisfaction, to become a private licensed pilot. This person may take any passenger he desires except for hire.

"A life is a life! What difference should be made whether a person be a pay passenger or not? If a pilot is too inexperienced to pass a transport examination or limited commercial, he should be classed as too inexperienced to take up his best friend. The layman of today is willing to be convinced that flying is safe but he cannot be as long as there are so many indulgences in recklessness due to ignorance.

"I do not blame entirely the pilot who immediately after receiving the coveted award makes use of the passenger privilege nor the passenger who accepts his invitation. The Department of Commerce permits it. Therefore the layman believes a pilot qualified to safely transport him with ten hours solo credit.

"My solution is a suggestion: That a private pilot be allowed to fly anywhere but be permitted to carry passengers only if accompanied by a licensed pilot in a plane with dual controls. That as fifty hours has been considered by the Department of Commerce the time necessary to become proficient to carry passengers for hire over restricted areas, a pilot acquiring his limited commercial license be allowed to carry passengers alone for the first time—regardless of fee!"

F. B. I. from out North Dakota way soliloquizes on a number of things, including licensing of mechanics, the cost of airplanes, and the peversity of aircraft manufacturers in general:

"I was much interested in W. H. M. Watson's letter in the last issue of AERO DIGEST. He hit the nail on the head as far as he went, but being a non-flier he omitted some of the difficulties troubling the industry.

"One of them is the medical examination fees of fifteen dollars a year. I have heard a lot of complaint about this in the last year. Another thing is the new regulations in regard to mechanics' licenses. Out here in the sticks where we have mostly OX5's, OXX6's and Hissos there won't be a man who can qualify for a mechanic's license. Then I suppose we'll have to chase down to the Twin Cities every time we have to have some repairing or overhauling done.

"As to the cost of a plane, I believe he has it sized up about right. People can readily see that fifteen to eighteen hundred up to three thousand dollars for two or three hundred pounds of motor is ridiculous. We did notice one ninety-horsepower motor for about seven hundred—still too high. One can buy a 'straight eight,' with about that horsepower, all complete with extra tire, bumper, etc., for about that price.

"And another thing. . . . Recently, we planned on getting the agency for a small ship, so we wrote to several manufacturers. One company that spends thousands of dollars each year in advertising, did not answer. A second, also a frequent advertiser, also did not answer. The third would give us *three* counties on a contract for six ships, providing we'd finance their business to the amount of fifty dollars per ship in advance. We wrote them that 'we finance our business, you finance yours.'

"Also, with the hazards connected with selling ships the discounts are very small. We do not refer particularly to crash, but to hail and wind as the major dangers. And these sales managers expect one to sell 'em like bananas on a string.

"If one could get a state agency for a term of years he could afford to get out and spend some time and money building up a business but under the present system, just when one gets some sales worked up the factory gives the prospects the dealer's price with a 'vicinity' contract and the dealer who did all the missionary work goes off talking to himself."

Andrew Klyn joins the protest against sensational air shows:

"Why can't we have an accidentless air meet? The only one that seems to have been such is the one held at Detroit and from what I gather from your article on that event, it was because of the efficient management. Men in aviation believe that stunts attract crowds and they are right, but they forget that very few people are encouraged by these stunts to fly.

"Let us have a new type of air show with only licensed planes and pilots, properly regulated even if it takes one Department of Commerce inspector for each pilot. Shows should be used to educate the public. Well managed, popularly-priced joy hops would go far to popularize flying."

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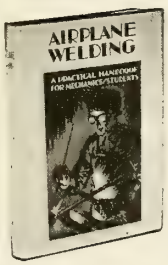
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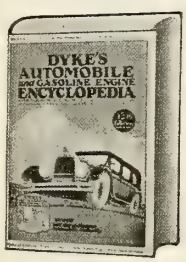
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THE AIR SERVICES

AIR CORPS NOTES

[C. MORRIS]

PRIMARY flying schools at March Field, Calif., and Brooks Field, Texas, will be moved to Randolph Field, San Antonio, Texas. Brooks Field will be the station of an Observation Wing to be formed from 22nd Observation Squadron now stationed at Maxwell Field, Montgomery, Ala.; an observation squadron at Fort Sill, Okla.; and the 12th Observation Squadron at Dodd Field, San Antonio. So that the bombardment group at Langley Field, Va., may be enlarged, the Air Corps Tactical School at that field will be moved to Maxwell. Fort Crockett, Texas, is scheduled to be moved to Shreveport, La., where a new attack group will be formed.

A TWO-MONTHS school of instruction in aeronautics will be held at Hensley Field, Dallas, Texas, for more than 100 officers of Army Air Corps and ten flying instructors, according to Capt. Harry Weddington, post commander.

CONTRACT has been let for the construction of a radio equipment house, a photography equipment house and a garage at the field of the Houston air unit of the Texas National Guard. The building will cost $20,000.

FLYING hours have been reduced at various fields in San Antonio, Texas, as a result of the reduced budget for the Army. A twenty-five to fifty per cent reduction from the present schedule has been made at Dodd Field, station of the 12th Observation Squadron. Instruction at the Air Corps Training Center will not be restricted by the new budget of flying time.

FEDERAL funds being expended on construction projects at Government flying fields in Texas total $11,372,956, according to a recent report of the War Department. Randolph Field will receive the greater portion of this sum, lesser sums going to Duncan Field, Fort Sam Houston, and Dryden Field.

Expenditures for projects now under construction total $9,119,330; funds appropriated for projects yet to be started amount to $2,253,626.

7th Bombardment Squadron Studies Machine Gun Fire

TACTICAL OPERATIONS of a heretofore untried nature have been engaged in by the 7th Bombardment Group, Army Air Corps, Rockwell Field, Calif., according to information recently made available.

Four condemned DH-4's were obtained for use as ground targets. The 95th Pursuit Squadron was given instructions to concentrate as much machine gun fire as possible on the targets. Accordingly, formation firing in three-plane elements was effected with devastating results. Each element started its dive from 800 to 1,200 yards from the targets and opened fire as soon as the sights could be brought on their mark. Both guns were fired simultaneously in bursts of from fifty to 100 rounds per gun.

Investigation of the targets revealed that every vital mark had been riddled by bullets. This work proved highly instructive to the entire personnel in demonstrating how much of this terrific pounding the present equipment can stand.

The 11th Bombardment Squadron received training in defensive formations and fire power by firing on a formation of sleeve targets towed by pursuit ships. The range varied from 1,000 to 1,500 feet. The Browning flexible guns were used, each bomber mounting three guns.

Both squadrons engaged in formation bombing, the 11th Squadron concentrating on a target anchored in the ocean, the 95th Squadron bombing the shadows of the bombardment formations.

WAR DEPARTMENT orders, recently issued, direct the following Air Corps officers to report for duty as students at the Command and General Staff School, Fort Leavenworth, Kansas, for the 1931-32 course: Majors Ralph P. Cousins and Charles B. Oldfield and Captain Clayton L. Bissell, all from the Air Corps Tactical School, Langley Field, Va.; Captain Early E. W. Duncan from Headquarters, 6th Corps Area; Captain Orlo H. Quinn, from Randolph Field, Texas; Captain Rosenham Beam, from Havana, Cuba; and Captain Charles B. B. Bubb, Air Corps Detachment, Fort Leavenworth, Kansas.

THIRTY-ONE students of the senior class in Aeronautical Engineering, Purdue University, recently visited Dayton, Ohio, and made a tour of inspection of the Materiel Division, Wright Field, and the Fairfield, Ohio, Air Depot.

Two New Squadrons Reconstituted

THE 9th and 31st Bombardment Squadrons have been reconstituted at March Field, Riverside, Calif., with Captains Leo F. Post and Earle G. Harper as commandants, respectively. The enlisted personnel for these two new organizations is made up of men from the various Air Corps stations throughout the country.

Akron Gets Crew of Sixty-three

SIXTY-THREE enlisted men, all veterans of service in naval dirigibles, were announced May 12 as the crew of the giant airship *Akron*, now nearing completion at Akron, Ohio.

THE SECOND AERIAL MEMORIAL Service honoring members of the air force, American Legion, Twentieth District, who gave their lives in the World War is scheduled to be held Memorial Day, May 30, at United Airport, Burbank, Calif. Ceremonies are to include addresses by Will Rogers and James Rolph, Jr., Governor of California. Planes will drop flowers from the air while the American Legion conducts the memorial services.

Air Corps Officer Makes Cross-Country Flight to Study Conditions Personally

A cross-country flight from Washington, D. C., to the Pacific Coast and return has been completed by Major Douglas D. Netherwood, Chief of the Finance Division, Office of the Chief of the Air Corps, according to information recently made available. Major Netherwood undertook the flight because he believes that "an officer cannot sit in Washington and really understand the great variety of problems bearing on widely separated fields operating under difficult conditions. The added touch of a personal visit is necessary to make the picture complete and to give him an intimate working knowledge of his job."

General James E. Fechet, Chief of the Air Corps, and Brigadier General Benjamin D. Foulois, Assistant Chief, are active pilots whenever possible, flying to various Air Corps posts throughout the country to obtain personal contact with actual conditions in the field.

Major Netherwood made the cross-country flight in a Fokker transport powered with a Wright Cyclone engine. Starting from Bolling Field, Washington, D. C., he flew to the Pacific Coast and returned twelve days later. He stopped at twenty-two points en route, including Rockwell, March, Crissy and Mather Fields on the Pacific Coast. The entire journey, covering a total distance of 6,202 miles, was completed in a total flying time of sixty-five hours and ten minutes at an average speed of approximately ninety-five miles per hour.

The best time on the entire flight was made between Denver, Colo., and Fort Riley, Kan., a distance of 430 miles, flown in three hours and fifty-five minutes and an average speed of more than 110 miles per hour. No attempt was made to break any speed records on the flight.

THE 95th Pursuit Squadron, flying Boeing Wasp-powered P-12 fighters, has been engaging in high-altitude formation maneuvers with radio direction. The maneuvers have been held near the base at San Diego, Calif.

J. Q. DOHSE, production engineer, acted as the Boeing Airplane Company's official representative at the annual Army-Navy Standards Conference at the Naval Aircraft Factory. At this conference, consideration of problems involving standards of design and construction as well as the standardization of what might be termed "aircraft hardware" was included on the program.



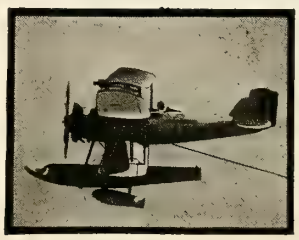
BUILDING STAMINA INTO CHANCE VOUGHT AIRPLANES

To this inspection table comes every tubular part—and only perfect units ever pass it.

Welded into the engine mount and fuselage of every Chance Vought airplane are dozens of pieces of tubular steel. Rigid specifications fix the formula for the material. Careful inspection and tests of stock as it is received make certain that it meets requirements in strength, hardness, ductility and elasticity.

Then, when frame members are cut for assembling, after sand blasting to remove all dirt and grease, they pass to the inspection table shown above. Electric spinning and a high intensity inspection lamp equipped with magnifying lenses help skilled inspectors to spot the smallest flaw. And only perfect parts pass on.

There you have one of the basic reasons why Vought planes stand up in the rigorous service of the Navy and the Marine Corps. Launched from catapults . . . landed on surging steel decks . . . halted by relentless arresting gear . . . these airplanes, built in the modern Vought plant at East Hartford, thrive on hard service. Chance Vought Corporation, East Hartford, Connecticut. Division of United Aircraft & Transport Corporation.



CHANCE VOUGHT CORPORATION

Lieut.-Comdr. Rosendahl Inspects New Navy Airship Akron

[T. E. LUNSFORD]

THE naval airship *Akron,* which is under construction at Akron, Ohio, will be launched in July or August, according to information recently made available. Lieut.-Comdr. Charles Rosendahl was in Akron recently to inspect the airship and to arrange for land quarters for the dirigible's crew.

He expressed satisfaction with progress made on the Zeppelin and said he expected to have the crew and officers in Akron about June 1 so they can familiarize themselves with every detail of the ship's construction and assembly before they begin navigation. An additional crew of ten airplane pilots will be added later. They will have charge of the five airplanes that will be installed at Lakehurst, N. J., as part of the airship's fighting equipment. Members of the Akron's crew are being trained in airship manipulation by alternating with members of the crew of the naval airship *Los Angeles,* which is based at Lakehurst, future home of the *Akron.*

Boeing Issues Reports on Military Airplane Production

BOEING AIRPLANE COMPANY has begun production of 135 new-type Boeing military Wasp-powered pursuit planes on the Army Air Corps order totaling $1,541,366, according to a recent announcement of company officials. The new pursuit differs from the present Boeing fighter in that the body is of all-metal construction and incorporates various refinements.

The new contract from the Air Corps is the second largest order for pursuit planes issued since the war. The largest was received by the Boeing company in 1922 and called for 200 pursuits.

The Boeing company has made final deliveries on its 1930-31 Army contract, which called for 131 pursuit planes. The plant has completed forty-six Wasp-powered Navy fighters.

The company has completed test flights at Seattle of its new type, all-metal, low-wing, twin-engined (two 575 h.p. Hornets) bomber. The bomber will be flown to Dayton and Washington, D. C., for tests by the Air Corps.

One hundred and thirty Boeing Wasp-powered pursuit planes, P-12B's, C's and D's, participated in the annual Air Corps maneuvers involving 672 planes of all types. These Boeing fighters carry .50 and .30 caliber machine guns which can fire at the rate of 1,200 shots a minute between revolutions of the propeller.

Bring New Planes to Naval Air Station at Hampton Roads, Va.

The U.S.S. *Langley* arrived in Hampton Roads, Va., on May 15, carrying eleven F3B type planes which are spares for VF Squadron Three. These planes were delivered to the *Langley* by the Battle Force. The ship also carried three F6C-3 planes to be turned in to the Naval Air Station at Hampton Roads for further issue, in addition to three O2U-1s which compose the *Langley's* utility unit. The ship transported twenty-one F2B planes from the Battle Force to Pensacola, on the first leg of her trip north, to replace obsolete types at that station.

The two squadrons of the *Langley,* VF Squadron Three and VS Squadron One, arrived at Hampton Roads on May 13, finishing their flight from the U. S. Naval Air Station at Pensacola, where they left the ship. The flight was made to give pilots more experience in extended flight work, to complete gunnery exercises, and to start overhaul of the planes upon their arrival at Hampton Roads. There are eighten planes in VF Squadron Three, commanded by Lieut.-Comdr. Gerald F. Bogan, and nine planes in VS Squadron One, commanded by Lieut.-Comdr. H. V. Baugh.

THE NEW insignia of the 1st Observation Squadron, Mitchel Field, L. I., has been submitted to the War Department for approval. The design, developed by Lieutenant Wilson and Lieutenant Dwyer, consists of a cave man carrying a spear and standing before a background of a rising sun, with five rays in a sky of blue. The whole is encircled with a band of green and yellow, upon which are fourteen Maltese crosses. Each part of the design is significant of a phase of the squadron's history. The cave man is posed in an attitude of hunting, to denote observation; the rising sun bursting into five rays represents the beginning of Army Observation and the five major campaigns in which the 1st Squadron participated during the World War. The border of green and yellow represents the Mexican Border, and the fourteen crosses, symbolic victories in the World War.

Navy Department Tests New B/J Fighter and Sikorsky Amphibion

A single-seater fighter was demonstrated by Major Temple Joyce of the B/J Aircraft Corporation on May 19 at the Naval Air Station, Anacostia, D. C., after major modifications had been made in the ship. The plane was first tested several months ago by the Flight Test Section as the first of a new series of fighting planes with which the navy was experimenting. Certain modifications were agreed upon in order that a comprehensive study might be made of the basic type which the company had built. The effect of these changes was demonstrated in the most recent tests. The new type 41-A Sikorsky amphibion was demonstrated. This plane is basically similar to the large Sikorsky amphibion which has been undergoing service tests on the Pan-American lines. Generally similar to the S-38 type, the plane is larger and is powered with a Pratt and Whitney Hornet B engine. This plane is the first of an order for three new type 41-A Sikorsky amphibions.

MOORING MAST FOR NEW NAVY AIRSHIP

CONSTRUCTION of the giant mobile mooring mast which will be used to handle the navy airship *Akron* in ground operations has been practically completed by the Goodyear-Zeppelin Corporation at the airship factory and dock, Akron, Ohio. The mast is seventy-six feet in height, weighs 130 tons and is moved over the ground by a 240-horsepower gasoline engine.

Designed to be sufficiently stable to provide an all-night mooring for a Zeppelin, the chief utility of the mast will be in pulling the ship in and out of the dock. The mast is backed into the dock, the airship attached and pulled out mechanically, eliminating the necessity of a large ground crew. Aiding in this operation are docking rails, built out from the dock, and to which side handling lines of the ship are attached. Once outside the dock, the side handling lines are released from the rails, allowing the ship to swing into the wind. Upon landing, the same process is repeated, the mobile mast providing power to pull the ship back in the dock.

The mast is an open pyramid, or tripod, with the corners of its triangular base equally spaced on a circle 100 feet in diameter. At each of the three corners of the base is a caterpillar tractor, the two rear tractors serving to drive the mast forward, the forward tractor being used for steering.

Upon the triangular base is mounted a small machinery house, which contains a 240-horsepower gasoline engine and an electric generator. Underslung between the two rear tractors is a 125-horsepower electric motor. From these units, power is transmitted to the two rear tractors. Power generated by the gasoline engine is transformed into electricity in order that a smooth steady application of energy to the driving tractors may be had.

Mooring devices, consisting of a cone on the nose of the airship, and a cup on the mast into which the cone fits and is locked, are standardized on all airships and masts, thus enabling any airship to moor to any mast. Consequently, the head of the new mast, which is seventy-six feet above the ground, is essentially the same as provided in high masts. A new feature is that three plungers used in locking the mooring cone of the ship in the cup on the mast may be released simultaneously by the rotation of a cam; in previous masts each plunger is released separately. A winch is provided to haul in the main mooring cable as the mooring cone of the ship is drawn into the cup on the mast.

Because many airship flights are made at night or in the early morning, provisions have been made for the installation of floodlights on the Goodyear-Zeppelin mast.

The mast has been constructed so that it will be possible to increase its height with little difficulty in order to accommodate ships of increased size at later dates.

The mast, a "motorized hitching post" for airships, is of the type developed by the U. S. Navy at the Naval Air Station, Lakehurst, N. J., and operated there successfully in ground operations of the *Los Angeles* during the past two years.



To Issoudun Alumni Throughout the World

THIS appeal is a sort of rite in memory of our exalted dead who confided their last dream to France at old Issoudun in 1917-1918 and 1919. Then the cemetery and the monument beside it (erected by the French on ground given by a French family, but paid for by funds from the Plane News, officers and enlisted personnel at the 3rd A. I. C.) were only a kilometer from us. Today they are thousands of miles away. Our Buddies who wrote "finis" on the last page of their young lives, and wrote it in their blood, are not forgotten tonight nor were they neglected then.

Twelve years have fallen in on the Issoudun-Vatan road from then to now. More years, with their formations of days, will fall in as time flies by. They will carry us further from Issoudun. But may the assembling years, with their flight of days carry us not an inch from the memory of our dead Alumni.

The twelve years have been severe on the monument. It's "a patched monument now split by frost" writes Jack Niles, and Major Bob Walsh tells us of its neglected condition. They both agree that the French estimate that about five hundred dollars can restore it.

Already we have been asked: "How much do you need?" We appreciate that spirit, but we would not be true to ourselves if we failed to remember that that monument was erected by voluntary contributions from the Alumni of Issoudun and it's our heart's desire to restore and care for it from voluntary funds now.

And so we renew Liaison with all the Alumni of Issoudun by this appeal. We ask each member of the Alumni in different parts of the World to write a letter and enclose a check for two dollars to Aviators' Post No. 743. These two dollars will report at headquarters for you. They will show you are present and accounted for. They will show you are not missing from roll call.

Colonel Harold Hartney
Major Walter Kilner
Arthur Butler
Frank A. Tichenor
Father John Sullivan
Issoudun Monument Committee

AVIATORS' POST NO. 743
P. O. Box 600
Grand Central, N. Y. C.

AERONAUTICAL INDUSTRY

TO DISCUSS RULES ON AIRWORTHINESS REQUIREMENTS

SUGGESTED revisions in the Department of Commerce Airworthiness Requirements for Aircraft will be the subject of a conference to be held July 31, 1931, at the Department of Commerce, Washington, D. C., between aircraft manufacturers and the Aeronautics Branch of the Department of Commerce, according to a recent announcement of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics.

"The Airworthiness Requirements of the Air Commerce Regulations constitute a set of rules embodying requirements for structurally airworthy aircraft, which serve as a guide to the aircraft industry as to what will be required on new designs, Colonel Young said. "The Aeronautics Branch customarily invites the aircraft industry to confer with its officials when major amendments to these requirements are contemplated.

"The Department this year has only a few suggested amendments to present at the conference. The texts of these proposed revisions will be made available to manufacturers in the near future so that they will have an opportunity to study them before the date of the meeting in Washington."

Last year aircraft manufacturers conferred with the Department upon changes then proposed in these requirements at a meeting held in September. The proposed amendments became effective January 1 of this year.

This year's conference has been called at an earlier date to permit the new requirements, if any are decided upon, to become effective September 1, 1931, instead of January 1, 1932.

Completed Flight of More Than Seventy-Four Hours in Diesel-Powered Bellanca

CALIBRATION by the Bureau of Standards of the barograph carried by Walter E. Lees and F. A. Brossy on a flight to establish a new non-refueling endurance record, completed April 12 at Jacksonville, Florida, in a Bellanca airplane equipped with a Packard Diesel engine, established the official time the plane was in the air as seventy-four hours and twelve minutes, according to a recent announcement of the National Aeronautic Association.

This record exceeds by more than fourteen hours the American non-refueling duration record of fifty-nine hours, nineteen minutes and fifteen seconds, established October 1, 1928, at San Diego, Calif., by William Brock and Edward Schlee. It is within one hour and eleven minutes of the international record of seventy-five hours and twenty-three minutes for non-refueling endurance flights, set by the French pilots, Bossoutrot and Rossi, March 1, of this year, in a Bleriot airplane powered with an Hispano-Suiza engine.

In the seventy-fourth hour of the flight, as the pilots were flying above the beach at Jacksonville which had been the point of take-off and the point at which they planned to land, their plane was caught in an air current of a sudden storm and they were forced to land several miles distant out of sight of the National Aeronautic Association officials observing the record attempt. Because of the rules of the Federation Aeronautique Internationale, therefore, the record is unofficial as an American or international mark.

STUDIES of aviation activities for the purpose of improving further the safety record established by the aircraft industry, made by the Aeronautical Chamber of Commerce, have resulted in the issuance of a good practice safety code and the establishment of a permanent body within the organization to carry on the safety work. The group will be known as the Aviation Safety Conference. The code covers manufacturing, repair, inspection and operation of aircraft and the prevention of airport fires.

Ray Collins Starts Pathfinding Flight for National Air Tour

A PATHFINDING flight over the proposed route of the Seventh National Air Tour has been started by Ray Collins, manager, and Jack Story. They are to return to Detroit, Mich., on or about June 1. Following the completion of the flight a definite itinerary will be announced by the tour management.

The proposed route of the tour, scheduled to start from Detroit July 4 and return July 25, was announced in the May issue of AERO DIGEST. The tentative itinerary would take the tour to fourteen states, Canada and Mexico, making approximately thirty-two stops.

The National Air Tour is a competitive reliability and efficiency contest for the Edsel B. Ford Reliability Trophy. In addition to the Ford Trophy, there will be awarded to the first ten winners a total of $12,000 in prizes; and the Great Lakes Light Plane Trophy, contested for by planes having an engine displacement of not more than 510 cubic inches. This trophy was won last year by Cessna.

Officials Busy with Plans for National Air Races at Cleveland

FOR the purpose of inviting the leading pilots of Europe to participate in the National Air Races, Lieutenant Al Williams has been detailed to go abroad by the Standard Oil Company of Ohio. He will carry official invitations from Governor George White of Ohio, mayors of five Ohio cities and the air race management to the air ministries of England, France, Italy, Czechoslovakia, Germany, Poland and Spain, asking that these governments arrange to have their best pilots on the Cleveland schedule. He is due to return late in June.

Clifford W. Henderson, managing director of the races, plans to make the 1931 program as elaborate and constructive as possible. Every suggestion which is thought to have merit is given consideration for a place on the program, the Cleveland event being prepared to reflect progress in aviation as well as to provide competition and spectacles.

WOMEN PILOTS ORGANIZE BETSY ROSS CORPS

REPRESENTATIVES of seventy-six licensed women pilots met in Memorial Continental Hall, Washington, D. C., May 9 to form the Betsy Ross Corps. In ceremonies connected with the organization of the corps, they officially tendered the aid of the group to Major General James E. Fechet, Chief of the Army Air Corps, and Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics, Navy Department.

The purpose of the Betsy Ross Corps, Mrs. Opal Kunz, founder, told the military representatives present at the ceremonies, is to serve the country in time of national emergency by piloting ambulance and auxiliary planes in order to relieve the male pilots for combat duty.

Tribute to the organization was paid by General Fechet and Admiral Moffett. They were made honorary members of the Betsy Ross Corps, as was Clifford W. Henderson who, Mrs. Kunz said, has been of great aid in founding the organization.

Many of the seventy-six members of the corps own their own planes. In the future each corps area plans to obtain flying equipment and fields. One of these sites is expected to be in the vicinity of New York City. A tract of land to be used as a training field was recently presented to the corps by Dr. Frances Dickinson of Orange, Fla.

Fourteen members of the Betsy Ross Corps, present at the organization ceremonies, stood before the attending military authorities and took the oath of allegiance, read by Chaplain G. W. Wilson, director of aviation for New Jersey.

The women who took the oath were Mrs. Kunz, Miss Thelma Elliott of Baltimore, Miss Althea Murphy of Brooklyn, Miss Manila Davis of West Virginia, Miss Mary Goodrich of Hartford, Miss Lola Lo Lutz of Oshkosh, Wis.; Miss Mary Moore of Hartford, Mrs. Martha Morehouse Johnson of Columbus, Ohio; Miss Mildred Morgan of California, Miss Mary Nicholson of New York City, Miss Mary Alexander of Lynchburg, Va.; Mrs. Frederick L. Ames of Boston, Miss Peggy Remey of New York City and Miss Jane Dodge of Germantown, Pa.

ALMOST TWICE AROUND THE GLOBE AT OVER 3 MILES A MINUTE!



PUSHED to a height of over four miles by the jagged Alps, blasted by bad winds and weather along the way, Captain Frank Hawks has shown what he and a Wright engine can do by setting new records in his Travel Air!

In his first European flights he cut the time from London to Rome in less than half, and from Paris to London he flew in less than a single hour. These trips give the "Texaco 13" pilot a list of records equaled by no other in the world—records that mean something!

And the log of Captain Hawks shows a distance of more than 40,000 miles spanned at an average of 3 miles a minute—*behind the same "Whirlwind 300"!*

Yet, as Hawks explains it, these flights aren't feats. They are records made at his ship's normal speed . . . records, as he modestly puts it, actually won at the factory before he took the air!

Frank Hawks is not a wild stunt flyer. He flies faster than others because his Travel Air racer and his E-type "Whirlwind 300" are so improved in structure and power that his normal, unstrained cruising speed is enough to beat other ships flying at top speed.

That's what you get when you buy an engine by Wright—power enough to win world records. For every standard "Whirlwind 300" off the production line is the same in every improvement as the engine that Frank Hawks flies!

WRIGHT

AERONAUTICAL CORPORATION

PATERSON, NEW JERSEY

A DIVISION OF CURTISS-WRIGHT CORPORATION

DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

(Portuguese Guinea.) The German flying boat Do.X landed at Bolama after a 950-mile flight from Villa Cisneros, en route on a transatlantic flight to South America. (May 4).

(Japan.) Seiji Yoshihara, Japanese pilot, took off from Tokio on the first stage of a flight to the United States, via the Kurile Islands, Siberia, the Aleutian Islands, Alaska, San Francisco, Calif., and across the United States to Washington, D. C. He flew a Junkers all-metal monoplane powered with an Armstrong-Siddeley engine. (May 4).

Apparatus designed for installation on an airplane, to sight an airway light through fog and reproduce on the pilot's dash a synthetic beacon, was announced by W. F. Westerndorp of the General Electric Research Laboratory. (May 5).

(Germany.) A new world's distance gliding record of 165 miles was claimed by Pilot Groenhoff of the Rhoen-Rossiten Society after a flight from Munich, Bavaria, to Kaaden, Czechoslovakia. (May 5).

Two American pilots, Hugh Herndon, Jr., and Clyde Pangborn completed a round trip flight from Roosevelt Field, L. I., to San Juan, Porto Rico, in preparation for a projected world flight. They flew without maps and were accompanied by Capt. Lewis A. Yancy who acted as navigation instructor. (May 6).

An air meet sponsored by the Binghamton Chamber of Commerce and the Binghamton Airport Company was held at Binghamton, N. Y. (May 8-10).

Award of the Daniel Guggenheim Gold Medal for notable achievement in aeronautics to Dr. Frederick William Lancaster of Birmingham, England, for his contributions to "the fundamental theory of aerodynamics," was announced. (May 9).

Representatives of seventy-six licensed women pilots, meeting in Memorial Continental Hall, Washington, D. C., to organize the Betsy Ross Corps, tendered the aid of the organization to military officials in time of national emergency. Tribute was paid to the group by Major General James E. Fechet, Chief of the Air Corps, and Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics, Navy Department. (May 9).

The Second Annual Sportsman Pilots' Race held at Patco Field, Morristown, N. J., was won by Lawrence T. Sharples in a Travel Air biplane. The race was sponsored by the Aero Club of Pennsylvania. (May 10).

The Fifth National Technical Aeronautical Meeting of the A. S. M. E., was held at Baltimore, Md., sponsored by the Engineers' Club of Baltimore. (May 12-14).

(Germany.) Capt. Frank M. Hawks American pilot, flew the distance of approximately 621 miles from London to Berlin in two hours and fifty-eight minutes. (May 12).

First Annual Omaha Air Races were held at the Omaha Municipal Airport, Omaha, Neb. (May 15-17).

(Sweden.) The International Aero Exhibition being held at Stockholm. (May 15-31).

The First Air Division, Army Air Corps, comprised of 672 planes, was mobilized at Wright Field, Dayton, Ohio, for a training period in connection with the annual maneuvers of the Air Corps. (May 15).

(Mexico.) The Aeronautical, Industrial and Commercial Exposition was held at Balbuena Field, Mexico City. (May 15-21).

Twelve parachute jumps in a single day were completed by Frank Hammond from a plane piloted by Victor Brooks in a demonstration held in connection with an air circus at Caldwell, N. J. The greatest number of parachute jumps previously made in a single day was eight, completed by Thomas De Mann. (May 17).

(Germany.) Lola Schroeter Vorescou completed a parachute jump of 4,400 meters (14,435 feet) at Leipzig, breaking her previous woman's record of 2,600 meters. She was in the air for eighteen minutes. This was her 119th jump. (May 17).

An aerial parade and a series of tactical maneuvers and formation flight demonstrations were held over Chicago by planes of the First Air Division, Air Corps, as part of the annual field maneuvers. (May 20-21).

New York City was "attacked" and "defended" by air in a demonstration staged by the Army Air Corps as part of the annual field exercises. There were 672 planes participating in the aerial "battle" and parade. (May 23).

Dedication of Floyd Bennett Field, New York City, was held in conjunction with the annual maneuvers of the Army Air Corps. (May 23).

Dedicatory ceremonies in conjunction with the opening of the Red Cloud Airport, Red Cloud, Neb., were held. (May 23-24).

The First Air Division left New York City for the New England area to stage a series of demonstrations in connection with the annual maneuvers. (May 24).

A conference between officials of the Aeronautics Branch and representatives of air transport companies for the purpose of discussing Department of Commerce requirements governing scheduled operation of interstate passenger air passenger transport services was held at Washington, D. C. (May 25-26).

PROGRAM OF S. A. E. SUMMER MEETING

TWO sessions will be devoted to aeronautics at the Summer Meeting of the Society of Automotive Engineers at White Sulphur Springs, West Virginia, during the week June 14 to 19, and other sessions will be of interest to aeronautical as well as to automotive engineers.

At the aircraft session with Dr. W. G. Lewis as chairman, Assistant Secretary of the Navy for Aeronautics D. S. Ingalls will present "Flying with the Navy," a resume of the navy and naval aviation. This will be accompanied by moving pictures describing operations of the Naval Air Service at sea and illustrating many of the recent maneuvers in the Pacific Ocean off Panama. The relation of aircraft to successful naval operations and the position of the United States with regard to other countries in the matter of naval aircraft equipment will be discussed.

At the aircraft engine session, of which Arthur Nutt is chairman, "Air-cooled Cylinder Head Design" will be presented by R. Chilton of Wright Aeronautical Corporation, and "Recent Valve Developments," by A. T. Colwell of Thompson Products. The former paper will review recent developments in air cooling for reduced temperatures at increased output and will suggest lines for further investigation of air flow behavior over finned bodies simulating cylinder heads.

Also of aeronautic interest at the present time will be the Diesel engine session with W. F. Joachim as chairman. Mr. Joachim is well known as the author of many N. A. C. A. reports on the heavy-oil engine research of that organization and is engaged in this type of research at Westinghouse Electric and Manufacturing Company. A paper on "Automotive Diesel Fuels" will be presented by W. H. Butler of the Standard Oil Company of New Jersey, and on "Practical Experience with Devices for Damping Torsional Vibrations," by E. Sandner, Consulting Engineer, Dortmund, Germany, and J. B. Frauenfelder, Consulting Engineer, Philadelphia. In the former paper, a brief history of Diesel engine fuel oil and its manufacture, and data relative to controlling combustion in high-speed Diesel engines will be given. The latter paper will analyze the various devices now in use tor damping the torsional vibration of crankshafts of Deisel engines.

Among the papers dealing with fuel, "Further Developments in Determining Gum in Gasoline" will be presented by O. C. Bridgeman and E. W. Aldrich.

COMING AERONAUTICAL EVENTS

May 26-31. Midwest Air Race Tour, starting at Concordia, Kan., sponsored by Midwest Air Tour Association.
May 30. First Anniversary of United Airport, Burbank, Calif., and Second Annual Air Memorial Service of Aviation Post, Southern California Chapter American Legion.
May 30-June 1. Dedication of the Municipal Airport, Birmingham, Ala.
June. Pacific Northwest States Air Tour, starting at Portland, Ore.
June. First Annual Aviation Country Clubs Seaplane Cruise, sponsored by Amateur Air Pilots Association, on Atlantic Coast.
June 6-14. Meeting of the Federation Aeronautique Internationale, Bucharest, Roumania.
June 14-19. Summer Meeting of the S. A. E., Greenbrier Hotel, White Sulphur Springs, W. Va.
June 15. Start of Iowa Air Tour, Des Moines, Iowa.
June 18-27. Third Annual Michigan Air Tour, sponsored by Grand Rapids, Mich., starting and ending at Grand Rapids.
June 20-21. Air Races and dedication of Baton Rouge Airport, Baton Rouge, La.
June 25-27. Formal opening of the Municipal Airport, Waterville, Me.
June 29-30. Annual Meet of the Airplane Model League of America, Dayton, Ohio.
July 1-September 8. Trans-Canada Air Pageant from coast to coast, sponsored by Canadian Flying Clubs Association.
July 2-19. Light Plane Tour of Italy, starting and ending at Rome.
July 4-25—Tentative date of National Air Tour of 1931 for the Edsel B. Ford Reliability Trophy, starting and ending at Detroit, Mich.
July 23-24. N. A. A. Annual Convention, Washington, D. C.
July 31. Conference on Airworthiness Requirements for Aircraft, auspices Aeronautics Branch, U. S. Department of Commerce, Washington, D. C.
August 1-2. Air Circus, Scotts Airport, Oroville, Wash.
August 29-September 7. National Air Races, Cleveland Airport, Cleveland Ohio.
September 1-3. Twentieth National Aeronautic Meeting of S. A. E., Hotel Statler, Cleveland, Ohio.
September 11-13. Third Annual Sioux Falls Air Races, Sioux Falls, S. D.
September 12-13. Fiesta of the Air, Los Angeles Municipal Airport, Los Angeles, Calif., in conjunction with La Fiesta de Los Angeles.
September 12. Schneider Trophy Race over the Solent and Spithead course, Southampton, England.
October. International air mail conference, Brussels, Belgium.
November 10-12. Fall Transportation Meeting of the S. A. E., Washington, D. C.

AMERICAN EAGLE, LINCOLN COMBINE

MERGER of the American Eagle Aircraft Corporation of Kansas City, Kan., with the Lincoln Aircraft Company, Lincoln, Neb., was recently announced. The combined companies will be known as the American Eagle-Lincoln Aircraft Corporation of Kansas City, Kan. Negotiations for the merger were completed by A. A. Durante of A. A. Durante & Company, Inc., of New York, which purchased the assets of the American Eagle Company at a receivership sale; Victor Roos, president of the Lincoln Company, and E. E. Porterfield, Jr., president of the American Eagle company.

The American Eagle-Lincoln Aircraft Corporation will be headed by Mr. Roos, president, general manager and treasurer; Mr. Porterfield, sales manager; and J. S. Chick, formerly sales manager of the American Eagle company, assistant sales manager of American Eagle-Lincoln.

The new company has leased the factory from the American Eagle company which owns the real estate and buildings where the American Eagle plant has been located for the past two and one-half years. The new company will start production of approximately 300 unfilled orders for American Eagle and Lincoln planes. Until the Lincoln factory is moved to the Kansas City plant, parts for Lincoln planes will be filled from the plant at Lincoln and parts orders for American Eagles, from the American Eagle-Lincoln plant at Kansas City.

While the American Eagle-Lincoln Company has fifteen Approved Type Certificates and will continue to manufacture airplanes and parts on order under all of the A.T.C.'s, the Lincoln A. P. monoplane, the Lincoln Trainer and the American Eaglet will be the principal models produced.

MISCELLANEOUS FLYING OPERATIONS, 1928, 1929, 1930
(*Such operations as experimental, exhibition, student instruction and pleasure flying*)

	Jan.-June 1928	July-Dec. 1928	Jan.-June 1929	July-Dec. 1929	Jan.-June 1930	July-Dec. 1930
Miles flown:						
Licensed..	6,000,000	26,000,000	36,000,000	49,000,000	42,457,500	47,954,960
Unlicensed	6,000,000(B)	22,000,000(B)	11,000,000	14,000,000	9,309,700	8,547,000
Total...	12,000,000	48,000,000	47,000,000	63,000,000	51,767,200	56,502,560
Passengers carried:						
For hire..	(C)	(C)	(C)	1,032,752	716,400	1,124,092
For pleasure....	(C)	(C)	(C)	256,679	208,400	249,449
Total.....	(C)	(C)	(C)	1,289,431	924,800	1,373,541

(B) This figure includes reports from planes operating under letter of authority pending issuance of license. Beginning with 1929 the system was changed to eliminate the issuing of letters of authority.
(C) The Aeronautics Branch did not request passenger data for this period.

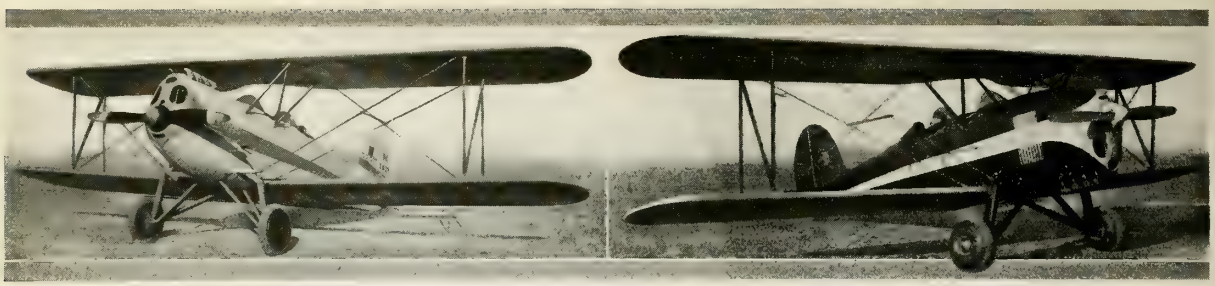
MILEAGE FLOWN PER ACCIDENT IN MISCELLANEOUS FLYING

	July-Dec., 1928	July-Dec., 1929	July-Dec., 1930
Miles flown	48,000,000	63,000,000	56,502,560
Total number of accidents	641	873	1,116
Miles flown per accident	74,883	72,165	50,630
Total number of fatal accidents	123	169	160
Miles flown per fatal accident	390,244	372,781	353,141
Total number of pilot fatalities	87	127	130
Miles flown per pilot fatality	551,724	496,063	434,635
Total number of passenger fatalities	120	134	104
Miles flown per passenger fatality	400,000	470,149	543,294
Total number of all fatalities (B)	207	271	258
Miles flown per fatality (B)	231,884	232,472	219,002

(B) Includes fatalities to pilots, co-pilots, students, passengers, aircraft crew, ground personnel and spectators.

Weather conditions during the last 6 months of the calendar year usually are more favorable for flying than during the first 6 months, hence, in making comparisons, figures for corresponding periods should be used in each case.

(*Compiled by the Aeronautics Branch, Department of Commerce*)



The Great Lakes Sport Trainer is powered with either an Ensign inverted or a Cirrus upright engine

THE GREAT LAKES SPORT-TRAINER

FOUR models of the Sport-Trainer biplane are being produced in 1931 by the Great Lakes Aircraft Corporation, Cleveland, Ohio. Choice of upright or inverted engine mounting and three color combinations is offered.

The Great Lakes Sport-Trainer is a tandem two-place, open-cockpit, single-bay biplane. The framework of the fuselage is constructed of welded chrome-molybdenum steel tubing with Warren truss bracing. The internal surfaces are oil-treated to prevent corrosion. The wings are built of routed spruce spars and stamped aluminum alloy ribs. Aluminum alloy tubular drag struts are provided. The leading edge is covered with aluminum alloy sheet. Uniform M-12 airfoil section is used. Interplane and cabane struts are N-type streamline steel tube. Interplane bracing wires are streamline steel tie rods. The tail surfaces are constructed of aluminum alloy frames, riveted. The stabilizer is adjustable in the air. The fin is non-adjustable and faired into the fuselage. The covering of the fuselage, wings and tail surfaces is of Grade A airplane fabric.

The landing gear is the split-axle type with spring oleo anti-recoil struts. The axle and brace struts are of streamlined chrome-molybdenum steel. Streamlined wire wheels are standard equipment. A leaf-spring tail skid with detachable shoe is provided.

The controls are the conventional stick and pedal type. All engine controls are installed on the left-hand side of the cockpit and are accessible from both cockpits. The elevators and rudder are operated by cables running direct from the stick and pedals to surfaces without pulleys or fairleads.

The seats are designd to accommodate cushions or seat-type parachutes. Head rest, back cushions, cockpit padding, safety belt, first aid kit, log book, fire extinguisher, tool kit, altimeter, tachometer, thermometer, oil pressure gauge, air-speed tubes, wood propeller and wiring for navigation lights are standard equipment.

Model 2T-1A Type A, is powered with a Cirrus four-cylinder in-line air-cooled upright engine of ninety horsepower This model becomes Model 2T-1A Type B when fitted with de luxe equipment.

Model 2T-1E Type A is powered with a four-cylinder in-line air-cooled inverted Ensign engine of ninety-five horsepower. When provided with the de luxe equipment, this model becomes Model 2T-1E Type B.

Special equipment includes Airwheels, toe-pedal-type brake control, Hamilton-Standard propeller, spinner for metal prop, compass and air speed indicator, navigation lights with Hot Shot battery, imitation leather lining for cockpits and special finish.

Wood propeller is standard equipment. The cowling is of the automobile type, supported independently of the engine and quickly removable. The engine is mounted in rubber anti-vibration dampeners. There is an aluminum alloy flameproof fire wall aft of the engine compartment. A soldered terne plate gasoline tank of twenty-six-gallon capacity is installed in the center section of the upper wing. A gallon of oil is carried in the engine and three gallons of oil are carried in a terne plate tank forward of the firewall.

Specifications

Span	26 feet 8 inches
Length overall	20 feet 4 inches
Height	8 feet 4.5 inches
Wing area (including ailerons)	187.6 square feet
Weight empty	1,016 pounds
Useful load	564 pounds
Gross weight	1,580 pounds
Wing loading	8.43 pounds per square foot
Power loading (2T-1A)	17.55 pounds per horsepower
Power loading (2T-1E)	16.63 pounds per horsepower

Performance

High speed	110 miles per hour
Cruising speed at 1,825 r.p.m.)	90 miles per hour
Initial climb	600 feet per minute
Endurance (at cruising speed)	4.10 hours
Radius (at cruising speed)	370 miles

A FLIGHT COURSE contest was recently completed by the Aero Club of New Brunswick, N. J. The first prize comprised an active membership in the club with a value of $250, donated by Robert Johnson, vice president of Johnson and Johnson of New Brunswick; a ten-hour course of flying instruction, donated by popular subscription; a Department of Commerce physical examination; and a helmet and goggles. The second prize, donated by Pilot E. E. Underhill, is a round trip from the Metropolitan Airport, Newark, to Washington, D. C., on the Ludington Line. The third prize, consisting of a one-hour flight, was donated by the club.

This contest was open to eighth grade grammar school graduates, between the ages of sixteen and eighteen. Eighty-six were enrolled. A series of lectures was held covering various phases of aeronautics. At the completion of these lectures a test consisting of thirty questions was given all applicants to determine the winner.

FIRST OMAHA AIR RACES HELD

THE First Annual Omaha Air Races were held at the municipal airport, Omaha, Neb., May 15-17, in conjunction with the dedicatory exercises of the field and sponsored by the Junior Chamber of Commerce. The program of events included aerial demonstrations and competitive events.

Because of the success of this year's event the Omaha Air Races will be held again next year, May 27-30, 1932, the races being increased from three to four days' duration, according to a recent announcement of Phil Henderson, manager of the races. Mr. Henderson has been retained as manager of the Omaha Air Races of 1932.

Aerial demonstrations included exhibitions by military and civilian planes and a Pitcairn Autogiro, the latter piloted by John Miller, Poughkeepsie, N. Y.

A total of twenty-two events was included on the program announced by the management. John Livingston won the twenty-five-mile free-for-all speed race with a time of eleven minutes and thirty-two seconds with Stub Quinby scond. Livingston was the winner of the fifteen-mile race open to planes with a cubic-inch displacement of 450 cubic inches or less with Jack Bridges second. A dead stick landing contest was won by Harold Newmann, who landed his plane eleven feet from the mark. Tex Rankin was second with twenty-one feet.

Sightseeing flights and an aerial parade over the city were made.

In addition to Mr. Henderson, officials of the First Annual Omaha Air Races included the following:

Dean Noyes, general air race chairman; members of the Omaha Air Race Association—M. M. Meyers, president; Verne W. Vance, vice president; G. Crawford Follmer, secretary-treasurer; and A. L. Jacobberger, Hayden W. Ahmanson, Rudy C. Mueller, H. W. Peterson, and Donald Halley, directors.

NEW AIRCRAFT CLEANSING COMPOUND ANNOUNCED

An aircraft and all-purpose cleansing compound known as Annite was introduced to the aircraft industry at the National Aircraft Show in Detroit by the uniformed service crew of the Quigley Co., Inc., of New York, N. Y. This service was offered gratis to all arriving planes needing cleansing and was made use of and enthusiastically received by many aircraft manufacturers and operators.

Annite is a rapid, harmless and efficient colloidal detergent, cleaning by the method of emulsification, needing only to be used in very small quantities dissolved in hot or cold water: even sea water may be used.

Other Quigley products introduced to the industry at the show were Triple-A, a protective coating, not a paint, which will not crack or peel and is immune to the action of heat, acids, salt water or other corrosive elements. Due to these virtues, this compound can be used to advantage in innumerable and diversified applications in the aviation industry.

Q-Seal, the third product exhibited, is a plastic expansive joint sealing compound. It is a newly discovered mineral—a phenomenon of nature—which expands several times its own volume when subjected to heat. Q-Seal is used wherever protection is required against joint leakage.

MAINE

[F. V. FOLLETT]

THE formal opening of the municipal airport, Waterville, Me., will be held June 25-27. The runways will be ready for use June 1 and the hangar accommodation for four or five planes is already completed. Airways Incorporated, the operating company, has been incorporated with Wesley H. Marden as treasurer and manager; Caleb Lewis of the *Waterville Sentinel*, president; and Harold Dubord, mayor of Waterville, secretary.

Air Activities at Rockland

THE State Muster Grounds, on the heights overlooking Augusta, Me., are being cleared of obstructions that have so far rendered it hazardous to large ships. This will give the state capital a landing field with clear approaches to runways about 2,000 feet in two directions.

Capt. Bert Fowler, of the State Police, is organizing an air service to be known as the Kennebec Fliers, Inc., of which he will be president and treasurer. Geo. O'Donnell will be vice president, and M. Day Legere, secretary. Jack Dodge, formerly pilot for Crymble Aircraft, is pilot.

THE passenger run projected by Maine Air Transport Company between Rockland, Vinal Haven, North Haven, and Stonington is now an accomplished fact. On May 1, Bill Wincapaw began operating a Travel Air on a schedule of two trips a day for ten days, frequently making special trips. Beginning May 11 the service was increased to three trips, leaving Rockland at 8:00 a.m., 1:00 p.m., and 4:30 p.m. The round trip, about fifty miles, is accomplished in a little more than one hour of flying.

PORTLAND has two flying clubs, both operating from Stroudwater Airport: the Portland or Stroudwater Flying Club and the Sullivan Flying Club. The latter has ten members and the equipment consists of an OX-5 Waco. They have purchased an OXX engine from Curtiss-Wright for use in their Waco.

CHARLES TREAT, Curtiss-Wright pilot, is back in the Moosehead lake region, with a Challenger-Robin on pontoons. He will establish a base at Greeneville and conduct an air service for the benefit of sportsmen and local residents.

CONNECTICUT

NORTHEASTERN AIR SERVICE, INC., operating at New Canaan, Conn., for the past two years, have taken over the Bridgeport Airport, Bridgeport, Conn., with the same organization.

[F. A. TARBELL]

Developing New Haven Airport

NEW HAVEN'S municipal airport will in all probability be well on its way toward completion by July 1. Under the personal direction of Lieut. Jack Tweed, manager, progress is being made in the construction of the field equipment house and the administration building. According to Mr. Tweed, the equipment house should be finished by June 1 and the administration building is scheduled for completion on or about July 1.

The first section of the field, sixty-eight acres in extent, graded and seeded last fall, is now in condition.

A new eighteen-acre section, under development at the present time, is to be finished by July 1 at the time the administration building is completed and opened. The work of fencing in the airport is about three-fourths completed.

The Second District, Department of Connecticut, American Legion, has through its aeronautical officer, Frank Tarbell of Hamden, asked the municipal air board of the City of New Haven for permission to run an air meet in conjunction with the official opening and dedication of the new municipal airport which will take place about Labor Day.

THE aviation dinner sponsored by Commissioner Charles L. Morris and the State Department of Aeronautics, was attended by more than seventy-five pilots and 100 guests from among the persons more intensely interested in aviation in Connecticut. It was held April 28 at the Aviation Grill, Savin Rock.

COMMISSIONER CHARLES L. MORRIS will fly from Marysville, Mich., a Buhl Pup, purchased recently by the state for the purpose of making short inspection trips. A two-place job in the 100 to 125-horsepower class will be purchased in the near future for the same work. The type or model has not been decided upon as yet. The Vought now owned by the state will be used in cross-country and patrol work.

NEW YORK

JOSEPH A. POTCHEN has recently been transferred to the Eastern sales division of the Haskelite Manufacturing Corporation, New York City, in an engineering and sales capacity. Mr. Potchen is a graduate of Northwestern University, where he received the degrees of Master of Science and Electrical Engineering. After graduating from Northwestern University, Mr. Potchen became a member of the faculty in the Engineering Department and held this position until 1927, when he joined the Haskelite corporation.

RESIGNATION of Dr. David Visel as vice president in charge of sales of the Curtiss-Wright Flying Service, has been announced. Sales activities will be coördinated with operations and service under the direct supervision of Major E. H. Brainard, president of the organization. Karl Day, assistant to the president, and Lee Warrender, service manager, will extend the scope of their work to handle the details of this consolidation, tying together these three departments.



Cleaning a Rearwin monoplane with Annite all-purpose cleansing compound

COLONEL PAUL HENDERSON has been elected chairman of the board of National Air Transport, Inc., and a vice president of United Aircraft & Transport Corporation.

Philip G. Johnson was elected president of National Air Transport, and Lester D. Seymour, vice president and treasurer. Mr. Johnson is also president of Boeing Air Transport, Pacific Air Transport and Varney Air Lines.

PRODUCTION of Edo Float Model 500, designed for installation on gliders, has been announced by the Edo Aircraft Corporation, College Point, L. I., N. Y. The float is eight feet nine inches long, eighteen inches wide, nine and three-fourths inches deep, and has a weight of twenty-nine pounds. A pair of these floats are designed for gross weights up to 500 pounds. Floats of this type have been successfully used on a Detroit Gull and a Cessna primary glider.

IRVIN QUICK-RELEASE PARACHUTE HARNESS

THE Irvin Quick-Release parachute harness, embodying the principles of the Irvin Standard harness but designed to permit the pilot to release himself instantly in the event of an emergency parachute landing in water, has been developed by the Irving Air Chute Company, Buffalo, N. Y. Provided with a four-point suspension to the canopy, the Quick-Release harness is designed so that the points of suspension are at the shoulders and the pilot descends in a sitting position.

The leg straps, back strap and seat strap as used on the Irvin Standard harness have been redesigned in such a way on the Quick-Release harness that they are held together and releasable at one point in a quick-release fitting in front of the pilot. This results in more comfort and provides a means whereby the pilot has only to turn and release one fitting in order to free himself instantly from the harness and parachute. A ninety-degree turn of the release fitting unlocks the harness straps and slight pressure simultaneously releases all straps.

The straps of the release fitting into which the various harness straps converge cannot be connected unless the fitting is properly set to receive and lock them in place. Possibility of accidental release is eliminated because once inserted into the fitting the straps are automatically locked into place and cannot be released except by deliberate action on the part of the pilot, according to officials of the Irving company. The release fitting has been designed so that working parts will not rust, or otherwise become affected by weather, and its proper functioning prevented by water, grit, dirt or other foreign substances coming into contact with it.

A back pad is provided to hold the harness in correct position at all times and to facilitate putting it on, either in or out of the cockpit. If for any reason the fitting should be out of order, the harness cannot be put on because it is necessary to actuate the working parts of the release fitting in order to connect the harness straps, according to company officials.



Views of the Irvin Quick-Release 'Chute Harness for general service use

The Irvin Quick-Release parachute harness is adaptable for use with all Irvin packs with the exception of the Lap Pack and is offered as optional equipment. The apparatus is designed for general service use without the necessity of complicated instructions.

NEW JERSEY

[F. L. FITZPATRICK]

PITTSBURGH AIRWAYS, INC., has cut the flying time between Philadelphia and Pittsburgh from three hours to one and three-quarter hours. The new planes in use on the line are Orion and Lockheed cabin monoplanes.

LUDINGTON'S Camden-Atlantic City airline will commence operations June 1 with a fleet of Stinson passenger planes running on regular schedule.

WINGS CORPORATION, distributors of Waco planes in this district, have removed from Central Airport to a new flying field near Ambler, Pa. The vacated quarters at Central are being utilized by Ludington, Inc.

PENNSYLVANIA

FIRST of the mechanical engineering students who have taken the aeronautics option at the Carnegie Institute of Technology, Pittsburgh, Pa., will be graduated this year. This option was established three years ago and is now in full operation in the three upper classes.

The course requires four years to complete and includes practically all of the courses given to mechanical engineers, in addition to a number of courses in the various subjects pertaining to aeronautical engineering. Considerable laboratory work in aeronautics and a number of annual trips to aircraft manufacturing establishments and research laboratories are included in the curriculum.

The course of instruction is designed to give students a suitable foundation for aircraft manufacturing and research work.

PHILADELPHIA

[R. GARD]

PITTSBURGH AIRWAYS, INC., recently began operating planes on a 105-minute schedule between Philadelphia and Pittsburgh. Four planes are flown in each direction every day.

MEMBERS of the Society of Automotive Engineers recently witnessed demonstration flights of the Autogiro at Pitcairn Field. The demonstrations were a feature of their annual meeting held at Baltimore May 12-14.

THE MAY MEETING of the Aircrafters was held recently at the Hotel Rittenhouse. The speaker was Horace Knerr, president of Metlab, Inc., who gave a talk on "Aircraft Metallurgy."

PITTSBURGH

[J. W. THEIS]

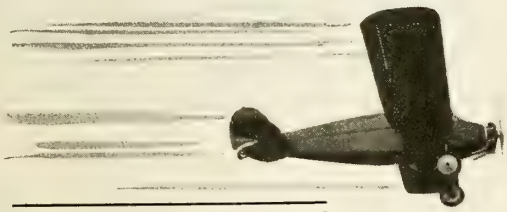
WITH THE ADVENT of warm weather, activity at all the airports has shown a great increase. Officers of the 324th Observation Squadron, stationed at Rodgers Field, have been keeping their Consolidated PT-1's in active service during the past month. Airports participated in Pittsburgh's Hospitality Days program by offering special rates on passenger flights down over the Golden Triangle of the metropolitan center. Announcement has been made that the County Airport, now under construction, will not be completed until sometime late in the summer. The field was to be ready for use by June.

CAPTAIN BAZLEY recently landed his Curtiss-Wright "Junior" on the northern side of Flagstaff Hill, Schenley Park, on the Carnegie Tech campus. The demonstration of the feasibility of landing in restricted urban districts proved successful.

ACTION

at Leonard "FLO" AIR COLLEGE

Action! That's what you're going to see in aviation this year — and that's what Leonard Flo students are getting now! Real training on **new** types of ships — ALL with modern air-cooled engines. Here at the Flo College you will find Barling, Arrow, Spartan, Bird and Stinson Airplanes powered with Warner, Kinner, Genet and Whirlwind engines. You'll get plenty of flying time — 20 to 25 hours if necessary instead of the usual 18 on a private pilot's course — 60 to 65 when necessary instead of 50 on a limited commercial, and corresponding time for transport pilots. And with every flying course a Pilot's Transport Ground course, thorough and complete, patterned after army instruction, taught by Brooks and Kelly Field men.



EVERY STUDENT RECEIVES MONOPLANE, BIPLANE, CABIN AND WHIRLWIND TRAINING

At the Flo College, you don't merely get time on one type of ship. **Every** Flo student, even private pilots, receives training on monoplanes, biplanes, cabin and Whirlwind-powered ships. And with every flying course a Transport ground course is included. You'll like the Flo school — the enthusiasm and friendliness of students and instructors alike. Quickly you'll sense the feeling here — that great things are going to happen for boys now training here.



EXTRA ADVANTAGES IN DETROIT

The Flo Airport in Dearborn is just 15 minutes by car to the heart of the Detroit business district. It is easily reached by street car or bus. Three minutes from our field is the great Ford plant. Nearby also is the Ford Airport and the factories of Detroit Aircraft (manufacturers of Lockheeds, Ryans and Eastmans), Stinson, Verville, Towle, Stout, Buhl, Warner, Continental, Packard and others. At the Flo College you are in the center of a hotbed of aeronautical activity. The thoughtful student will consider these **extra advantages** and the splendid contacts he can make outside and beyond his regular training.



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MARYLAND

[E. W. WALSH]

All-Women's Air Show

MORE than 5,000 persons attended the All-Women's Air Show, held at the Curtiss-Wright Airport, Baltimore. Women pilots present included Miss Thelma Elliott, Mrs. Benjamin H. Brewster, 3rd, Mrs. Victor P. Noyes, Miss Marion Clark, Miss Sophie D. Spieker, and Miss Ruby Harrell, all of Maryland; Mrs. Marie Alexander, of Lynchburg, Va., Mrs. Katrina Canning, Wilmington, Del.; Miss Frances Harrell, Valley Stream, N. Y.; Miss Laura Morgan, New York City; Miss Juliet Marston, Caldwell, N. J., and Mrs. Marie S. Chadbourne, New York City.

AN altitude record for Maryland of 16,800 feet was established by Miss Thelma Elliott. The previous altitude record made in 1924 by Major Charles A. Masson was 12,300 feet.

New Aviation Laws

A NEW law passed by the Maryland Legislature provides that towns with a population in excess of 4,000 must be marked with letters four feet long for identification from the air. The new law permits the town to abbreviate its name, but it is the desire of the Maryland State Aviation Commission, which is responsible for the passage of the law and its approval by Governor Albert C. Ritchie, that the name be printed in full.

Another act passed by the last Maryland Legislature provides for the exemption from taxation of aircraft of five deadweight tons and over.

The Maryland State Aviation Commission responsible for the passage of these acts is composed of Dr. Hugh H. Young, chairman, Clarence W. Whealton, Lieut.-Com. DeWitt B. Ramsay, Benjamin H. Brewster, 3rd, and Major Charles H. Masson.

TENNESSEE

[V. MATHEWS]

A Curtiss-Wright "Junior" was recently purchased and placed in use by the Sky Riders School at McConnell Field, Nashville. The plane was flown from St. Louis to Nashville by F. F. Frakes, salesman for the Sky Riders and Curtiss-Wright planes. Mr. Frakes was accompanied by Jimmy Sanders, who reports that the trip was made in four hours and fifty minutes in unfavorable weather conditions. This is the first time that a new Junior has been secured for permanent use here, according to Mr. Frakes.

OHIO

THE Truscon Steel Company of Youngstown, Ohio, has announced the appointment of Garret A. Conners as vice president, director of purchases. Mr. Connors has been affiliated with the company for twenty-four years as an executive in the production division of Truscon. In his new capacity Mr. Connors will have complete charge of purchases for all Truscon plants, maintaining his headquarters in Youngstown, Ohio.



Garret A. Conners

THROUGH the action of stockholders, merger of the International Derrick & Equipment Company and the Stacey Engineering Company was recently effected to form the International Stacey Corporation. The home office of the new company will be located at Columbus, Ohio.

[T. E. LUNSFORD]

Organize Air Police Squadron

A squadron of sky police has been organized by Safety Director Edwin D. Barry of Cleveland. Police Chief George J. Matowitz will have command of the unit, members of which will serve without compensation. They will wear special police uniforms, patterned after those of the New York squadron, and special police badges.

Clifford W. Henderson, manager of the National Air Races, will have charge of the unit with the title of flight commander. There will be two captains, nine lieutenants, a flight surgeon, a provost marshal and an adjutant. Members of the squadron will make their own arrangements for the planes they will use. Later, plans for raising funds to purchase planes will be considered. Functions of the unit will be confined to aerial traffic patrol alone.

Model Plane Meet

THE Airplane Model League of America will hold its annual meeting in Dayton, June 29 and 30. Some of the contestants will be sent to the meeting by aeronautical organizations, business or professional clubs and civic groups. Others will come on savings or will hitchhike. All will bring model planes representing their own ingenuity and handiwork. Prizes will be awarded the winners of the numerous competitions.

New Companies Formed

INCORPORATION papers have been issued by the Secretary of State to the Hilltop Flying Service, Inc., Columbus. The company is authorized to issue 250 shares of no par value stock. The incorporators are A. M. Wheaton, Charles S. M. Krumm and Charles A. Schwenker. Incorporation papers have been issued to the Toledo Air Service Corporation, Toledo. The company is authorized to issue 250 shares of no par value stock. The incorporators are Sigmond Sanger, Lenore Wylie and Florence Hastings.

LAURETTA SCHIMMOLER, Bucyrus, Ohio, has been elected governor of the North-Central district of the 99's, a national aeronautical association for women. She succeeds Mrs. Blanche Noyes of Cleveland. Miss Schimmoler was recently appointed manager of the Bucyrus Airport.

MAJOR JOHN BERRY holds the job of directing by means of radio the movements of airplanes within a radius of fifteen miles of the Cleveland Airport. Major Berry, known as the "air traffic cop," is vested with authority to instruct pilots to stand by or to come through. If a transport plane, carrying passengers who want to make a quick train or plane connection, is late, Major Berry, by means of his radio transmitter, instructs other planes to stand by, thus enabling the transport to come in on the glide, saving the time necessary for the flight around the airport, required at other times. A large map and a tabulation system keeps Major Berry posted at all times as to the location of planes leaving and approaching the port.

COLUMBUS

[W. DONALD WALTER]

EXTENSIVE PLANS were made for the reception and entertainment of the Ninth Observation Group, Air Corps, making an over-night stop at Columbus en route to the concentration at Wright Field prior to the beginning of the Air Corps maneuvers. It was originally planned to have the group, which consists of about forty O1-E's, land at Norton Field where the ships would be inspected and serviced, but later plans called for a landing at Port Columbus. The latter field, being considerably larger than the Government base, is better suited for the landing of fast service type ships in formation.

For the first time since the inauguration of the annual Air Corps maneuvers, National Guard organizations are taking part this year. The 112th Observation Squadron, 37th Division Aviation, Ohio National Guard, is sending five O-38's as Ohio's representation. From observation of this organization's flying during recent months, it is a foregone conclusion to the writer that the Ohio contingent will hold its own in the field with Regular Army units.

JOHN M. VORYS has succeeded C. Leon Morris as chairman of the Aeronautical Division of the Columbus Chamber of Commerce. Mr. Vorys, a Naval Aviator during the war, was Ohio's first Director of Aeronautics.

MAJOR MUEHLENBERG'S O2H is to be taken to Fairfield for installation of a shielded engine to permit the use of radio. The Major will fly the ship to Bowman Field for participation in Corps Area maneuvers

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in conjunction with ground troops. Our other O2H, assigned to Norton Field for the use of Reserve Officers, is undergoing general overhaul at Fairfield Air Depot. We hope that it will soon be returned to us because we have no other service type ship available at present.

A FLIGHT TUTOR has been installed at Olentangy Park, a Columbus amusement resort, and is proving one of the most popular attractions on the grounds. According to latest reports, it is being carefully avoided by old-time pilots, whose prestige might suffer if they found themselves unable to pull the device out of a spin in the presence of a large and appreciative audience.

MOST of the T. & W.A. pilots who are members of the Air Corps Reserve, frequently spend their off-duty hours at Norton Field flying the Army PT's.

THE BILL introduced in the Ohio Legislature by Representative Earl Johnson of Painesville, vetoed several weeks ago by Governor White on the ground that it vested legislative powers in the Director of Aeronautics, was signed by the Governor after being re-drafted and passed again by both houses. In its new form, the law amends the Ohio aeronautic code to conform to Department of Commerce regulations. The law also increases the Director's salary to $5,000 a year. The present director is Frank M. McKee, well known in the Air Corps, and formerly Commanding Officer of Norton Field.

MICHIGAN

FIRST carload of Buhl "Bull Pups" to be shipped from the Buhl factory at Marysville, Mich., went to Mamer Air Transport at Spokane, distributors for Washington, Oregon and Idaho, according to a recent announcement of Buhl officials.

A second carload was shipped to Charles B. Hughes, at Los Angeles, Calif., distributor. Eight flyaways brought the total of deliveries by May 13 to twenty-four planes.

EMPLOYEES of the AC Spark Plug Company, Flint, Mich., are now on a full-time employment basis, consisting of nine hours daily, five and a half days a week, according to a recent announcement of company officials.

[J. M. HILL]

Air Tour Pathfinding Flight

FOUR planes recently left Grand Rapids, Mich., on the pathfinding trip for the Third Annual Michigan Air Tour which is scheduled to start from Grand Rapids on June 18. The event is sponsored by the Grand Rapids Chamber of Commerce, cooperating with the Junior Chamber association.

Talbert Abrams, president of the Abrams Aerial Survey Corporation, Lansing, led the pathfinders. Wayne J. Sheldon, tour referee and president of the Detroit Flying Club, was at the controls of another ship. S. B. Steers, state aeronautical inspector, and Byron D. Coats, tour manager, were in the party. Coats flew in a plane piloted by Roland Pierson of Grand Rapids.

The pathfinding tour will reach points heretofore untouched by previous tours, particularly in the Upper Peninsula.

GOVERNOR WILBER M. BRUCKER on May 1 signed the bill passed by the Michigan Legislature, providing for the development of a state aviation weather reporting service in conjunction with the U. S. Department of Agriculture, and for the charting and establishing of civil airways throughout the state. The act takes immediate effect.

New State Licenses Granted

THREE new airports and two landing fields were granted permanent operating licenses by the Michigan board of aeronautics at its last meeting. The airports are Sky Port at Mt. Morris, Genesee County Airport at Grand Blanc, and Plainfield airport, Grand Rapids. The fields receiving landing field licenses are Clyde Wilks Post airport, Gaylord, and Caro airport at Caro.

Permanent licenses were granted to four new schools, as follows: Leonard Flo Air College, Detroit, transport; National Air Service, Detroit, private; Blackcat Flying Service, Detroit, private; Detroit Aviation Schools, Detroit, ground.

Seven permanent licenses for flight instructor were granted to the following pilots: William C. Gage, Battle Creek; James S. Monroe, Detroit; Glen Owens, Caro; R. F. Carnes, Kalamazoo; Lester W. Nicol, Muskegon; Heddin L. Smith, Battle Creek; Lovell D. Honeywell, Grand Blanc. Frank Overcashier of Detroit was given a ground instructor license.

ALL commercial and privately owned aircraft operating over the lands and waters of Michigan must be registered with the state after August 1, 1931, and annual fees based upon the empty weight of the plane shall be paid into the state treasury by the owner of the craft, under provisions of a bill signed May 4 by Governor Wilber M. Brucker.

To Ban Unlicensed Planes

THE MICHIGAN board of aeronautics during the next two years will seek the elimination from the state of all planes other than those licensed by the U. S. Department of Commerce, it has been announced by Maj. Floyd E. Evans, director of the board.

It is not intended arbitrarily to prohibit identified and other unlicensed aircraft at this time, Major Evans pointed out. The board feels that such a course would unnecessarily work a hardship on a large portion of Michigan's airplane owners, since the same result can be obtained by less drastic means.

The plan of the board will be to encourage systematically the licensing of all planes, and to educate the aircraft pilots and the public to the advantages in safety to be derived from this course. If the board's warning is not heeded, at the end of the two-year period, legislation to enforce the move will be in order, Major Evans said.

WISCONSIN

THE Airways Equipment, Inc., Plymouth, Wis., is manufacturing an illuminated cone, seventeen feet long, with a red nose of glass imported from Germany and a white body, for use as a wind indicator. The cone is the invention of F. C. Czapiewski, and has been installed at many of the commercial airports.

[W. SCOLLARD]

MIDWEST AIRWAYS, INC., Milwaukee, has secured the state selling rights for the Buhl "Bull Pup," powered with a forty-five-horsepower Szekely engine. The company has accepted delivery on one ship at the local airport. The Wadhams Oil Company has chartered one of the planes for a tour of the state by its salesmen.

HOLTERHOFF FLYING SERVICE has announced plans for immediate expansion of operations at its Brown Deer airport. Three planes have been ordered which will increase the number in service to six. Jack Lowe, former general sales supervisor of the American Eagle Aircraft Corporation, has been appointed business manager.

HAROLD C. WESTFAHL, Milwaukee pilot, who for the last two summer seasons has been operating the Westfahl Airways at Oconomowoc, has transferred his base of operations to the Milwaukee County Airport. Carl Martin is his chief pilot.

MIDWEST AIRWAYS, INC., Milwaukee, on May 15 opened its field and flying school at Lake Delton near Kilbourn, Wis. Two pilots, a mechanic and an assistant mechanic are employed at the Delton port.

ESTABLISHMENT of Kenosha's municipal airport is now under way and $2,100 of the $5,000 necessary to build the hangar has been pledged, according to Dan O. Head, president of the N.A.A. in Kenosha.

MINNESOTA

[H. A. LINDBERGH]

THE St. Louis board of county commissioners has purchased a site and appropriated funds for clearing the land and grading runways of a field adjacent to the county fair grounds at Proctor.

BIDS are being received from Duluth airplane companies for daily flights to be made under the supervision of the Agricultural Department for upper air observations. Duluth may be selected as one of eight stations to make weather tests by plane rather than by means of the balloons and theodolite.

ESTIMATES are being received for the remodeling and repairing of the three hangars at Wold-Chamberlain Field of Minneapolis, occupied by a unit of the U. S. Naval Aviation Reserve. On July 1, bids will be called for the construction of a 30 foot by 100 foot brick addition to the main hangar. Lieut. M. D. Crawford, Commanding Officer, and other officers will ferry during the

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early part of June three Curtiss Hell Divers from the factory at Buffalo to the naval unit's base at Minneapolis.

A SIKORSKY amphibion has been purchased for use in the forest regions of northern Minnesota and elsewhere by E. W. Backus, president, and associates of the Backus-Brooks Company.

ON June 1 the Northwest Airways, Inc., added another link to its system through the inauguration of daily air mail, express and passenger service between Duluth and the Twin Cities. A Sikorsky ten-place amphibion makes the 150-mile run in about one and one half hours. Jerome H. Sparboe is pilot and C. J. Schlapkohl, co-pilot. The one way fare is $8 and the round trip $15.

THE Minneapolis sub-committee which will work in connection with the Aeronautics Branch of the Department of Commerce on traffic control is as follows: chairman, L. D. Hammond, manager of the Wold-Chamberlain Field; secretary, Harold Lathrop; and Gage Mace, C. W. Holman and A. C. Godward.

IOWA

[R. W. MOORHEAD]

BURTON GARRETT, Grinnell, Iowa transport pilot, has purchased the interest of Joel Stewart in the airplanes and hangars at the Grinnell airport. He will equip the planes for night flying and plans to improve the hangar grounds.

State Air Tour Route

THE tentative route for the 1931 Iowa air tour, to start on June 15 is as follows: Des Moines, Centerville, Ottumwa, Burlington, Davenport, Iowa City, Waterloo, Mason City, Fort Dodge, Council Bluffs and returning to Des Moines.

MISSOURI

WALTER H. BEECH, president of the Curtiss-Wright Airplane Company, St. Louis, Mo., has announced that during the week ending May 2 twenty-eight airplanes were sold. Eighteen of these ships were the Curtiss-Wright Junior, the two-place sport plane designed especially for flying clubs and private owners.

[M. SHEETZ]

THE LICENSED WOMEN pilots of Kansas City have organized "The Women's Aero Club of Kansas City" to promote aviation. Dorothy Lyon is president. This group is sponsoring a series of free lectures on aviation subjects, with prominent members of the aviation industry in Kansas City as speakers.

TUXHORN AIR LINES of Kansas City has started operations on its new passenger line between Kansas City and Springfield, Mo., with Clinton as a flag stop. The inaugural flight was made by an aerial caravan, with the line's ship escorted to Springfield by eleven planes of the 430th Pursuit Squadron and twelve civilian planes. One flight daily each way is made, with Stinsons as equipment. Blaine Tuxhorn is president of the new company, and Lee Swigert, formerly with T. and W.A., is traffic manager.

MERCURY AIRCRAFT at Fairfax Airport, Kansas City, is continuing production of the "Mars," an eight-place ship built as a combined mail and passenger transport. J. H. Bichler, general manager of the Mercury company, states that this plane has been approved by the Department of Commerce.

MISSOURI VALLEY AERO CLUB, operating from the Kansas City Airport, has been reorganized with Ted Jefferson as operations manager and one of its instructors. Members pay annual dues with additional charge for each hour of flying time.

PIONEER GLIDER CLUB of Kansas City has been formed with M. C. Anderson, James Ennis, Harry Gronberg, Clifford Nelson, Lowren Stock and John Tobrason as members. The club is operating from Richards Field, and uses a Nelson primary type glider.

OKLAHOMA

OKLAHOMA has joined with many other states in the adoption of a uniform law regulating planes and pilots within the state boundaries.

This measure prohibits the operation of unlicensed ships and pilots in the State of Oklahoma and embodies recommendations of the Department of Commerce in its attempt to obtain uniform aerial legislation for all states.

This bill was sponsored and supported by C. W. Short, Jr., manager of the Tulsa Municipal Airport; R. F. Garland of the Garland School of Aeronautics; John H. Leavel, and A. M. Alcorn of the Department of Commerce.

CONSTRUCTION of the new administration building at the Tulsa Municipal Airport has been started. This building will contain a large waiting room, airline offices, ticket offices, mail and baggage rooms, barber shop, restaurant, and other facilities for the passengers' convenience on the first floor, while on the second floor provision will be made for the airport executive offices, field observation room, and the meteorological department offices.

The fields' runways will be improved. C. W. Short, Jr., manager of the Tulsa port, is making a study of the improvements of various large airports with the view of incorporating their best features in the new Tulsa plans.

A garage will also be constructed on the port for pilots and passengers.

[W. H. WITT]

Air Mail Celebration

A CELEBRATION was held at Oklahoma City, Okla., May 12, in commemoration of the fifth year of air mail service for the city. A dinner was held May 8 in the Commerce-Exchange building in honor of Lester Seymour, vice president and general manager of N.A.T. and to conduct a suitable indoor program for the occasion under the direction of H. C. Martin, chairman of the Oklahoma City Aviation Committee. Special program was given by the Oklahoma City air mail club under the direction of Harold Halsell. A committee met each mail plane in and out of the city on May 12.

FAMILY Sunday sky excursions at a flat rate for the plane rather than so much per passenger has been inaugurated at the municipal airport, Oklahoma City, by Capt. William Bleakley and Lieut. Clint Johnson.

CONSTRUCTION work has been started on the new municipal administration building of the Oklahoma City airport, which will cost more than $60,000 and will be completed by July 1, according to Guy Brown, city engineer. The building will be located at the new port which is west of the present municipal airport.

SPRING exhibition flying has been started at the Oklahoma City Curtiss-Wright airport, according to Lee Dice, manager. Penny-a-pound flying and parachute jumping will feature regular Sunday afternoon attractions throughout the spring and summer months.

TWENTY per cent reduction on round trip fares between Oklahoma City, Wichita Falls and Lawton was effected in May by Oklahoma-Texas Airlines, Inc., according to Robert Tarbutton, manager. Round trip is $8.

MRS. HOWARD PRESSLER, Oklahoma City pilot, has been named president of the women's branch of the National Aeronautic Association. Other officers include Mrs. James Brazell, first vice president; Mrs. C. H. Seaton, second vice president; Mrs. W. E. Fletcher, secretary; and Mrs. Warren Mozley, treasurer. Other members are Mrs. B. S. Graham, Mrs. Clinton Johnson, Mrs. William Bleakley, Mrs. Paul Braniff and Mrs. Lee Dice. All are wives of pilots.

BURRELL TIBBS has leased ten state airports which he will operate, including the Ada airport. He will operate flying schools on the ports and provide connections from the smaller towns to the regular stopping points of national air services running through the state.

[F. E. SCHOFIELD]

APPLICATION FOR a charter authorizing the formation of a $110,000 Oklahoma City aviation company to build and operate a hangar and shop on the new Oklahoma City airport and to continue the operation of the present Bleakley-Johnson Flying Service, has been announced by William E. Bleakley and Clint T. Johnson.

The company, to be known as the Oklahoma Aviation Service, Inc., will maintain the present air school and construct a hangar on the new field. The hangar will be 120 feet by 120 feet. It will be used for storage of planes owned by individuals, airlines and

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Standard Night Plane Display	36.00
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other companies. The hangar will house from twenty to twenty-eight planes.

A fully equipped repair shop will be operated.

The flying service will be continued under the direction of Bleakley and Johnson. This service includes cross-country charter flying, local passenger hops, student instruction and sale of airplanes. The Oklahoma Aviation Service, Inc., will be an agent for Curtiss-Wright products.

Officers of the company include Johnson, president; Bleakley, vice president; and Todd E. Nelson, secretary-treasurer. They are to be directors of the company with Harvey P. Everest, Oklahoma City periodical distributor. Three more directors are to be selected.

A REVISED schedule showing twenty-six daily planes in and out of Oklahoma City was made public May 8 by the Chamber of Commerce air traffic club.

CHARTER of incorporation has been granted the Graham Aviation, Inc., Oklahoma City. The incorporators are Burdette S. Graham, Antoinette R. Graham and Leslie Paris all of Oklahma City. Capital stock is $10,000.

TEXAS

A BASIC patent on dewaxed paraffine base lubricating oil has been issued by the U. S. Patent Office to the Texas Pacific Coal & Oil Company, Fort Worth, Texas. The invention is the work of Dr. Erwin R. Lederer, vice president of the company.

[C. MORRIS]

TEXAS now has a law making it a felony for anyone to tamper with aircraft, air safety devices or equipment at an airport. The perpetrator of such a violation which results in a fatality may be prosecuted for murder.

A FLYING SCHOOL has been opened in Brownwood, Texas, by Louis G. Geinsendorf, pilot for Central Texas Aircraft Company.

CONTACTS

By FRANK E. SAMUELS

Professional Pilots Association

THE regular monthly meeting of the Professional Pilots Association, held at their clubrooms at the Terris Hotel on Tuesday, May 5, was attended by an unusually large number of members and visitors. During the business session three new members were elected, one of whom was Richard B. Barnitz, manager of the Los Angeles Municipal Airport, "Mines Field," who is in charge of aviation activities for the city.

Blind Flying Instruction

ON May 9 and 10, the Los Angeles Municipal Airport was devoted to "blind flying," under the auspices of the Professional Pilots Association. A number of planes equipped with blind flying instruments and hoods were loaned to the association for the tests by the Army, Navy, Hancock Foundation of Aeronautics and private flying schools. Representatives of these organizations and others served as instructors. All pilots were allowed a given time to familiarize themselves with this phase of flying. George Vowter, Department of Commerce inspector, was in charge, assisted by members of the Pilots association. A complete test was made by each pilot, including straight flying, turns and banks. Transport pilots were given first consideration but all licensed pilots had the opportunity of flying. At times there were as many as twenty pilots awaiting their turns.

Hold Air Rodeo at Los Angeles

UNDER the auspices of the Aviators Post and the Fire Fighters Post of the Legion of Honor, an air rodeo was held at the Los Angeles Municipal Airport May 10, attended by more than 30,000 spectators. Three twenty-five mile closed course airplane races were staged. The program of events included a woman's race, won my Miss Jean Allen; a 500-cubic-inch displacement race, won by Ralph Buschey; an 800-cubic-inch displacement race, won by J. S. Wakefield; and a model plane contest won by John Berges. A number of exhibitions of acrobatic flying kept the audience interested. The Los Angeles Firemen's Band furnished the music throughout the day.

A feature of the show was the parade and exhibitions given by the Cycloplane Company, with three of their little ground trainers and two of their little flying jobs. Dick Myhres and Al Larry were at the controls in the flying exhibition given in two of the planes.

Joe Nikrend, official timer for the N. A. A., had charge of the air races, performing with his usual efficiency. Many of the leading pilots of Southern California were present, as well as a great number of municipal and state officials.

THE Curtiss-Wright Flying Service at the Grand Central Air Terminal, Glendale, has inaugurated a course of aerial photography. The new branch is under the direction of H. A. Erickson, San Diego. Erickson reports considerable interest and a number of students already enrolled.

LESLIE H. BOWMAN, for six years in charge of service and field sales for the Kinner Airplane & Motor Corporation, with headquarters for the past three years in New York City, is now the Western factory sales representative of the Waco Aircraft Corporation for the fourteen Western states. Leslie is making his headquarters with Roy T. Minor, California distributor of Waco, at the United Aircraft, Burbank.

FOR the purpose of facilitating the handling of air mail from planes to the new field postoffice, established by the Government at United Airport, Burbank, an especially large door has been opened on the airport side of the terminal building. Trucks can be loaded and unloaded from this entrance and wheeled out to waiting planes on the runway apron. The Government's decision to establish this air mail field postoffice greatly speeds up the handling, dispatching and distributing of air mail. In many cases, air mail, unloaded by any of the three contract air mail lines operating at United Airport, is sorted and re-routed over another line leaving the airport.

Announce Air Scholarships

THE Hancock Foundation College of Aeronautics, in Santa Maria, California, has provided several scholarships which will undoubtedly be of interest to young men planning careers in aviation.

Two of these scholarships will be offered to high school graduates for the complete junior college aeronautics course. This is a two-year course in technical and engineering subjects. One of these scholarships will be awarded to a young man from the Eastern or Southern states, while the other will be awarded in the Central or Western states.

From among the members of the junior college class, two men will be chosen at the end of their first year and awarded additional scholarships, as follows: To the cadet ranking first in the class, a transport flying course will be given provided he shows the necessary physical and psychological qualifications for flying. If not, he will be given a master mechanics course scholarship.

The transport flying course scholarship will then be awarded to the highest rated cadet in the class with necessary qualifications for flight training. In any case, both the flying and master mechanics scholarships will be awarded in each class.

CALIFORNIA

W. G. HERRON, formerly vice president of Air Investors and vice president of Boeing Air Transport, has been made vice president of Alloil Lubricants, Ltd., Glendale, Calif., according to a recent announcement of officials of the company.

Alloil Lubricants, Ltd., recently announced the acquirement of the business of the Alloil Lube Corporation, with new facilities for the manufacture and distribution of the entire line of Alloil specially processed lubricants in liquids, semi-solids and solids for industrial and automotive uses.

ACTIVITIES during the months of April and May have been the greatest in the history of the Northrop Aircraft Corporation, eight Northrop Alphas having been completed and delivered during this period, according to a recent announcement of company officials.

Five Alphas went to the Western Division of Transcontinental & Western Air, Inc., for the inauguration of their new twenty-four hour service to New York. Three standard Alpha Transports were completed and delivered to the U. S. Army Air Corps.

The first model of the new Beta has been completed and tested. This model is now in production at the Burbank factory. Production plans call for one a week of this new model, equipped with Menasco Buccaneer engine. The new building adjacent to the factory has been completed and $75,000 worth of new machinery is being installed.

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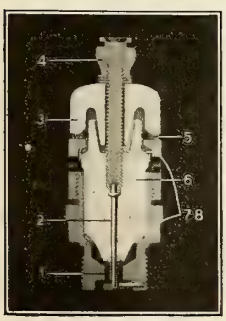
Designed especially for aircraft service, Champion Aero Types are gaining ever-increasing preference among experienced pilots, transport line operators, and the aviation industry at large.

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Champion Aero Type Spark Plugs incorporate all the time-tested and exclusive structural and operative superiorities of all Champions, and in addition are specifically designed to give better performance and greater dependability in every aircraft engine.

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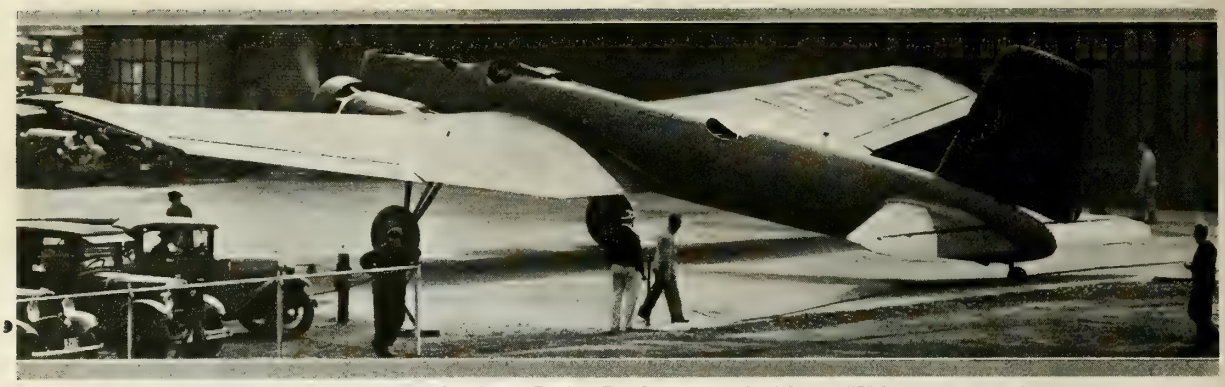
(Subsidiary of Bendix Aviation Corporation)

AERONAUTICAL CHAMBER OF COMMERCE

DEPENDABILITY

SIMPLICITY

ACCESSIBILITY



Flight tests were made recently of new Boeing Bomber powered with two 575-horsepower engines

ALAMEDA

[H. V. WALDORF]

Complete Seaplane Base and Harbor

THE elaborate yacht harbor and seaplane base at Curtiss-Wright Alameda airport has been completed. Anchorage space is provided for more than 250 boats. The harbor, on which work has been under way for more than a year, is 2,000 feet long and 600 feet wide. Six destroyers, placed end to end, serve as the western bulkhead. A concrete bulkhead is the north boundary and the east line is a beach. Facilities include a marine repair station and fueling station. The harbor has been dredged to a depth of fourteen feet at mean low tide and entrance to it is gained through deep water.

AMPHIBION service between the San Francisco Bay Airdrome in Alameda and Lake County vacation resorts, was inaugurated recently by Air Ferries, Ltd.

The flight from the airdrome to the Clear Lake base requires one hour. Land travel time averages four hours.

The schedule of the service calls for trips each week end.

SELECTION of San Francisco Bay Airdrome in Alameda as the Northern terminal of an hourly air transport service to link San Francisco and Los Angeles, was announced May 6 by W. F. Bliss, general manager of the Century Air Lines.

The service, included in the company's plans for a nation-wide network of passenger airlines, is to start June 1.

OAKLAND

[H. V. WALDORF]

SIX Ford trimotors have been ordered by Pacific Air Transport for service between the San Francisco Bay region and Seattle, the deliveries to be completed by June 1.

The purchase follows the taking over of the West Coast Air Transport run.

The southern operations base is at Oakland Municipal Airport. Stops are made at the San Francisco Bay Airdrome in Alameda to pick up and discharge passengers.

A COURSE in aeronautics, preliminary to intensive study of the subject to be offered in the fall semester, has opened at Technical Evening High School, Oakland. Robert W. Knight of the Boeing System is instructor. Classes are held Tuesday and Thursday evenings.

WASHINGTON

BOEING AIRPLANE COMPANY, Seattle, Wash., is now employing approximately 800 men, according to a recent announcement of company officials. This number will be increased gradually as production on military orders affects all departments.

[C. M. LITTELJOHN]

Airway Uses Floating Hangar

A new $25,000 floating hangar has left Seattle to be towed to Ketchikan, Alaska, where it will serve the Alaska-Washington Airways as an intermediate repair base for the company's planes flying between Seattle and Juneau, Alaska, according to Ross Cunningham, vice president and traffic manager of the company. The floating hangar was recently built for the company in Seattle, and provides what is reported to be the most completely equipped airplane base in Alaska, with a length of 100 feet and a width of fifty-seven feet, space for nine planes, repair equipment, quarters for pilots and mechanics.

IDAHO

[I. M. DURNIN]

Start Boise-Spokane Service

FLYING schedules of the Moscow Air Transportation Company, operators of the Boise-Spokane, Wash., plane service were recently announced by Harry Ruddach, manager, upon arrival in Boise on the initial spring flight. George Woodruff, pilot, accompanied him to Boise.

ARIZONA

A NEW radio range station has been authorized by the United States Department of Commerce, Airways Division, to be built east of Kingman, near Berry Station, Ariz.

A HANGAR is being constructed on the Nogales Airport by Thomas Griffin, wealthy young cattleman and aviation enthusiast. The building was designed by Gilliam and Company of Phoenix and will cost, when completed, about $50,000. The building will be 114 feet deep and will contain, in addition to the hangar space, an office, shop and sleeping quarters for transient fliers.

GOVERNMENT beacons to guide planes flying across Arizona have been installed along the Northern Arizona route and are being installed along the Southern route, several contracts having recently been let for establishing the electric lines.

THE NEW steel hangar being erected at the Douglas International Airport has been completed.

UTAH

[G. PERRINS]

Developing Salt Lake City Airport

SPENDING $79,878.03 on the municipal airport from the time it was established in 1927 to January 1, 1931, Salt Lake City has made splendid progress in aviation work.

The airport, which has grown until it is the second largest in point of air mail traffic in the nation, furnishes employment to more than 100 men. Engaged in regular traffic are twelve incoming planes and twelve outgoing planes each day and from ten to 100 visiting planes each month. There are ten hangars at the field: One of these is owned by Salt Lake City, another by the Air Corps, four by the major transport companies and four by local flying concerns.

Included in the $79,878.03 expended was $16,310 for 380 acres of land. The remainder was used for salaries, lights, electricity, water lines, sewers, drains, sand, road oil, gravel, cinders and general maintenance of the field, according to City Commissioner Harry L. Finch, in charge of public property.

THE drive to the airport, Provo, Utah, is being improved, a new bridge being installed across Smith's channel and brush cleared away to widen the highway along the Provo River.

THE 329th Observation Squadron and Photographic Section will train at the airport, Salt Lake City, July 5-18.

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for Business or Pleasure



LOWEST PRICED AMPHIBION IN THE WORLD

$5,800... PRIVATEER!

PRIVATEER'S economy of operation and remarkably low price of $5,800—several thousand dollars lower than that of any other amphibion in the world—mark it as an outstanding investment for the three great air-minded classes, flying schools, salesmen and sportsmen.

Rugged of construction . . . smart in appearance . . . the two-place open cockpit monoplane PRIVATEER (A. T. C. 370) is designed and manufactured by pioneer makers of amphibions. In stiff tests it has shown unusual stability, ease of control and maneuverability . . . and its adaptability to landing condition—snow, ice, rough terrain and water considered—has amazed experienced pilots. Flying range adequate for all reasonable needs . . . motor parts extremely easy of access.

A dependable Warner "Scarab" motor of 110 h. p. provides a high speed of 95 miles per hour . . . a cruising speed of 75 . . . a landing speed of 41 . . . a climb of 650 feet per minute . . . a cruising range of 250 miles. All this with a useful load of 600 lbs.—performance aplenty.

Naturally, because it is ideally suited for the use of the three great air-minded classes, dealers who sell the PRIVATEER have entry into a vast market. Just as the purchase of a PRIVATEER is a good investment for its owner, so is a territorial appointment for distribution . . . for Amphibions, Inc. dealer policy provides a liberal profit on each sale.

For complete information concerning the territorial appointments that are now being made, write or wire

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Low Pressure Tires
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Oil Thermometer
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J. SCHUBERT

571 E. 31st Street, Paterson, N. J.

ENDURANCE MONOPLANES OF FRANCE

(*Continued from page 75*)

and a half tons as it took off. Its wing loading was 120 kilograms per square metre. It is powered by a 650-horsepower Hispano-Suiza engine. The cantilever wing, which has a total area of 70 square metres, houses the fuel tanks. The combined capacity of these tanks is 7,200 litres.

The fuselage is of monocoque construction of moulded form. It has a small cabin arranged in the forward part, the pilot occupying an open cockpit above it. The plane has an underslung radiator carried before the landing gear. This undercarriage is of the divided type, entirely enclosed by streamlined casings. The following are the specifications and performances of the Bernard, type 80, endurance plane.

Length	15.50 metres
Span	24.50 metres
Area	70 square metres
Weight empty	3,086 kilograms
Weight fully loaded	8,600 kilograms
Fuel capacity	7,200 litres
Oil capacity	350 litres
Ceiling with full load	2,000 metres
Maximum speed	250 k.m.h.
Cruising speed	185 k.m.h.

BIRMINGHAM AIRPORT

(*Continued from page 62*)

The arched roof is of a mineral surfaced covering in chrome yellow and black combination, which makes for high visibility. On top of the roof, lying flat, is a large electric sign with letters twelve feet high, spelling *Birmingham.* Immediately above the name is an illuminated eighteen-foot letter "M," which is the Department of Commerce designation of a municipal airport. On top of the hangar also is an illuminated wind direction indicator in the shape of a large "T" which can be easily read from above, giving the pilot the true direction of the ground wind.

Construction materials used in the airport include the following: two miles of pipe sewers, 850,000 common bricks in sewers, 2,200 barrels of cement, 500 yards of sand, 10,000 yards of slag, 5,000 pounds of reinforcing steel, 350,000 cubic yards of excavating and grading, 15,000 cubic yards of rock to be removed, 135,000 bricks, 60,000 board feet of lumber, 25,000 square feet of hollow tile, 150 cubic yards of brick mortar, twenty-six tons of steel, 175 tons of structural steel and miscellaneous items, such as door sash, etc. All materials are manufactured in the South.

TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

Planes With Edo Floats

THE Edo Aircraft Corporation, College Point, L. I., N. Y., has published a booklet containing full-page photographs of thirty-four planes equipped with Edo floats. The ships are represented in action on the water. Each illustration is identified by the name and model of the plane equipped, the power-plant and model of Edo float installed.

Pioneer Equipment Pamphlets

PUBLICATIONS describing products of the Pioneer Instrument Company, makers of aircraft instruments, Brooklyn, N. Y., have been prepared by the company as follows: drift indicator, type 625, circular; telepoint compass, type 619, circular; aircraft compasses; navigation lights, circular, tail and mooring lights, oil level gauge, type 628, circular; Consolidated aircraft panels, types A, B and C; and a booklet on Pioneer test equipment. The company recently published a booklet describing the office and factory of the Pioneer organization.

Small Generator Units

A publication, "Small Generator Units and their Applications," identified as Circular 1908, has been announced by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. The circular describes four different types of generators used where a small amount of electrical energy is necessary, but where no central station supply is available. Information is included concerning the following applications of these generators; outdoor construction, marine, small industrial plants, central stations and emergency lighting.

Airport Lighting Equipment

CATALOG 218-FA, superseding Catalog 218-F, "Westinghouse Airport Lighting Equipment," has been issued by the Westinghouse Electric and Manufacturing Company, Cleveland, Ohio. The catalog discusses the importance of proper airport lighting facilities and describes and illustrates the equipment made by the company for this purpose.

Material for Interiors

DISCUSSION of the uses of Micarta, a building material for interior decoration, are contained in a booklet published by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Micarta is a material made by the company by hot-pressing sheets of fibrous material previously impregnated with an organic binder. It is produced in wood grain, tapestry, flat color and marble finishes.

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Primers, Lacquers, Varnishes, A complete instruction book for factory and field operators is available.

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Save from $85 to $110 on your Private Pilot's Course

. . . and learn to fly in less time by this new and safer method

THE new Solofly System of Flying Instruction was developed after much study and experiment by Lieutenant George Rockwell, former flight instructor in charge of Field 2 at Issoudun, during the World War. It has been his experience that students taught the feel of the controls and automatic coordination before going into the air become far better pilots than those forced to assimilate the instruction while flying in a dual controlled plane.

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LEARN TO FLY SAFELY, SURELY STEADILY
ADVANCE WITH CONFIDENCE STEP-BY-STEP

Patents for equipment applied for.
Entire system copyrighted by George Rockwell.

There are two features of the Solofly System of Flight Instruction which every prospective student should investigate in his own interests.

The first is price. The average Private Pilot's course costs anywhere from $300 to $400. Our price is only $215, including 10 hours of solo flying as required by the Department of Commerce.

The second feature, which is of even more importance to the student pilot than price, is safety. Our method of training does **not** force the fledgling to take his first lessons in a powered airplane. We teach him to master himself before we expect him to master a plane.

In the Solofly System the student is taught by easy stages. His first training is on the ground in a Coordinator, which familiarizes him with the feel and coordination of the controls.

When he is complete master of this stage, he is given instruction in the Taxiplane. The Taxiplane is a powered airplane whose wing area is insufficient to permit its leaving the ground. By this means he is able to learn the proper handling of a plane for taxi-ing and take-off.

The next step takes the student in the air—but still without power. A Glider is used to teach the student the handling of a plane's controls in the air and in landing, without power so that he will learn to take advantage of wind currents. If he is forced to make a dead-stick emergency landing some time during his flying career this training will help him to grasp a situation which might otherwise prove fatal.

The fourth stage in the Soloflight System is power-flight training in the Soloplane, a low-powered light airplane. An instructor accompanies the student on his first hops to check up on his ability and give him a few final instructions. From this point on the student is permitted to solo, in preparation for his Private Pilot's license.

During no period of training is the student subjected to needless danger or fears. By learning to fly in easy stages he automatically learns to control his emotions so that when he is put on his own in the air his full attention is devoted only to the handling of his plane.

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BIRD 90 hp. OX-5 3 place $1995

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FLYING MODEL BOMB DROPPER

R. O. G. Tractor with Clever Bomb Release

By R. E. DOWD

WE are indebted to thirteen-year old Chester R. Barker of 12026 Wilshire Drive, Detroit, Michigan, for the nifty little model offered this month. Here's how we happened to discover Chester and his model.

During the recent Detroit Aircraft Show we noticed a crowd of people at the Kari-Keen exhibit. Of course we all know about the trim little two-place Kari-Keen cabin monoplane, which is manufactured in Sioux City, Iowa. Its trim lines always stand out and the side-by-side seating arrangement has made it a popular sport plane. To return to our story, the crowd suddenly opened out in a wide circle, and as we drew closer we could see a young boy kneeling on the floor about to release his Kari-Keen model for a R.O.G. flight.

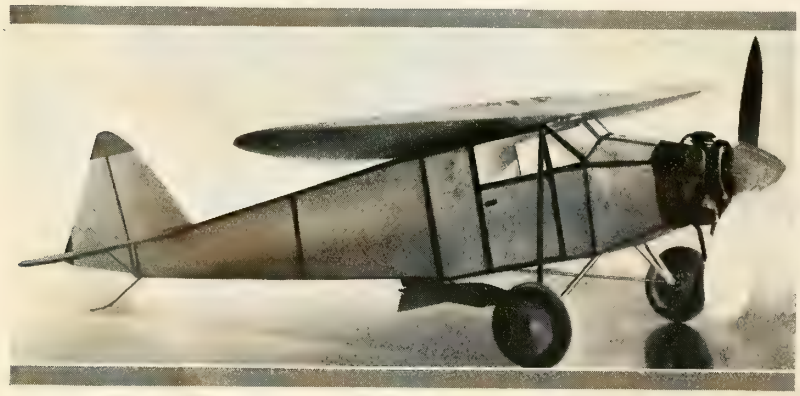
With a sweep she was off, climbing in wide circles up higher and higher almost to the top of the large tent used as an annex to the exhibition hall. But then the surprise came! As she started nosing down a black object was seen to detach itself and fall to the floor, and as it struck there was a loud "Bang!" We immediately pressed forward to get more information. It was then we met Chester, who was making an exhibition flight before the Kari-Keen officials. Incidentally, this flight rewarded him a few days later with a ride in the plane which he admired so much. He had no such an idea then, at least we assume he didn't, but you never can tell about these clever boys! Perhaps, he had it all figured out ahead of time. At any rate the flight was perfect and the little model lived right up to its name for it sure carried that bomb "keen."

We can hardly call the little ship a "bomber" for everyone knows that the Kari-Keen is a commercial ship. That is why we have compromised on the name "bomb dropper."

A closer inspection of the bomb revealed it to be made of balsa wood with a tack in the nose. This tack was the secret of the firing mechanism, for before each flight Chester would glue a small Fourth of July pistol cap to the head so that as it fell nose first, it would explode from the impact. The release device was nothing more than a hook, which allowed the bomb to slide forward as soon as the model nosed down.

Now that we have disclosed all the mysterious points of our model, let's get a little better acquainted with Chester. We mentioned before that he is only thirten years old. His model-building experience dates back only about a year but in that time he has turned out close to fifty different models. While Chester's school work takes up most of his time, he has managed to take out memberships in the A.M.L.A., the American Sky Cadets, the Hudson Junior Aviation Club, and several others. In fact, Chester sports a collection of badges and emblems about as pretentious as those of our war aces. In chatting with him we learned that he wants to be a pilot when he grows up, and that his favorite ship at the Show was the Lockheed, although the Kari-Keen has always attracted him.

In building the model here described, proportions were taken from a picture of the large plane, as he was unable to obtain actual drawings. While the bomb idea was original with Chester, it seems to have been used in many forms before. In some cases thread has been wound into the rubber strands in such a manner as to release, as it unwound, either bombs or parachutes. The simple hook as here explained is far more reliable, however.



Kari-Keen model, ready for take-off. Loaded "bomb" under fuselage

Materials Required

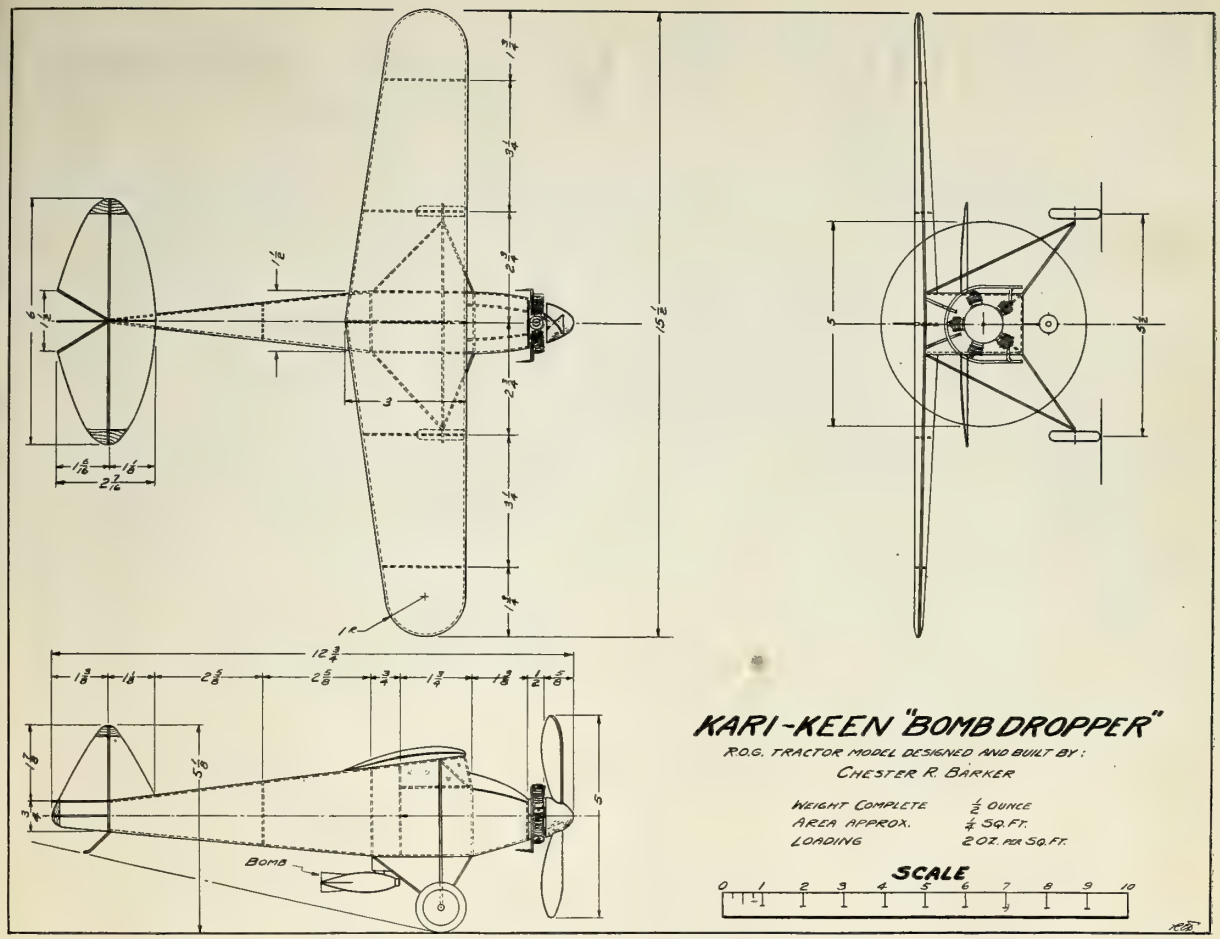
Balsa 1/16 x 1/16—Tail parts—fuselage and landing gear.
Balsa ½ x ⅝ x 5—Propeller.
Balsa 1/16 x ⅛—Wing leading and trailing edges.
Balsa 1/32 thick—Wing ribs and tips for fin and stabilizer.
Balsa ½ x ½ x 2—Bomb
Balsa Propeller spinner.
Balsa 1/16 x 3/16—Motor stick.
Bamboo for wing tips, tail skid, and engine exhaust ring.
Cellophane Cigar Wrapper—Windows.
Celluloid wheels.
Paper—Covering.
Wire—Hooks, propeller shaft, etc.
Brass—Propeller bearing.
Ambroid cement.
Tack—Bomb nose.
Caps—For bomb noise.
Red paper—For exhaust effect.

The Wing Construction

The leading and trailing edges are used for spars. The ribs, which are flat on the bottom surface, and rather thick like the Clark Y airfoil, are cemented in place between the spars. The tips are made from bamboo bent to shape over a flame. The upper surfaces of the ribs are kept straight when assembling the wing frame so that the dihedral angle on the lower surface equals the reduction in thickness of the ribs. As indicated in the drawing, the leading edge is straight.

The Fuselage

The entire fuselage frame is made of 1/16 square balsa, except the front bulkhead, which is of 1/16 thick balsa sheet with a hole at the center large enough to accommo-



date the motor stick, which fits in a wire clip at this point. No provision is made for supporting the rear end of the motor stick, which simply rests on the bottom of the fuselage.

The cellophane cigar wrappers may be omitted, of course, but it gives such a realistic effect that most model builders will want to use it for windows.

The bomb hook is made of wire, bent so that it is open forward as shown in the side view of the model.

The Tail

Apart from the bomb release arrangement, perhaps the most novel feature of the model is the construction of the tail surfaces. Not even thread is used for the outline. The balsa tips seem ample to support the paper, which is trimmed to the correct shape without any outline for support. This is both light and efficient. The stabilizer is given a slight up-curve at the rear edge so as to improve fore and aft or longitudinal stability. This is shown in the side view.

The Motor and Propeller

The dummy motor of balsa wood with bamboo manifolds and red tissue exhaust is attached to the fuselage permanently, but the motor stick, propeller, spinner, and so forth, are removable for winding and replacing the rubber. As mentioned before, a wire clip supports the motor stick which is 1/16 x 3/16 on cross section and 9 inches long.

The propeller is carved from a block ½ inch thick by ⅝ inch wide and the spinner is split and cemented around the blades. Two strands of ⅛ flat seems ample power to assure good R.O.G. flights.

The Landing Gear

All parts are made of 1/16 x 1/16 balsa wood cemented in place. The wide tread is very effective in allowing spiral climb take-offs and one-wheel landings as the model returns to the ground in circles. A wide tread landing gear is also helpful in resisting the effect of propeller torque as the model gets under way in R.O.G. flights. The wheels are of celluloid 1¼ inches in diameter and turn on wire axles cemented to the main gear. The tail skid is of bamboo and is also cemented in place.

The "Bomb"

While the bomb would seem pretty difficult to make, it is really about the simplest part of the model. It is carved from solid balsa wood 1/32 thick fins cemented on. A tack is driven in the nose and two small wire staples are pressed into the bomb as shown in the side view. The secret is to have these staples fit freely over the wire hook so that when the model noses down, the bomb will fall off easily.

It would seem that the location of the hook is rather far to the rear for best results, but it apparently works satisfactorily, so it must be that the bomb weight is not great enough to upset the balance of the model. In large bomb dropping planes great care is taken to hang the bombs at the center of gravity of the plane so that their presence or absence does not disturb the balance of the plane.

So here we have our trim, peaceful looking Kari-Keen all ready to fly, but concealed under its fuselage is the "deadly bomb." Perhaps this combination is not so incongruous as it might seem, after we stop to analyze it. Perhaps Chester's strange combination of sport plane and bomb dropper is more than a haphazard assembly. Is it not once again a reminder that the most peaceful of airplanes can be transformed into an effective fighting unit by adding bombs and bomb racks? Problems of national defense are, of course, the business of serious military leaders, rather than boys, but here is one point that we as aviation enthusiasts can learn from Chester's model—*commercial air strength is an aid to national security.* Let's therefore boost with all our might the air mail and the transport lines, not only because of their great value in performing their regular functions but also because of their great emergency value to our country.

And lest we forget, here's thanks to Chester for a clever little model, which we hope many of our readers will build and enjoy.

FOREIGN NEWS IN BRIEF

Compile from reports from AERO DIGEST correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

ENGLAND

Captain Hawks, American Pilot, Sets New European Inter-City Speed Records

SEVERAL new speed records for inter-Continent flying have been established by Capt. Frank M. Hawks, American pilot, in his Travel Air Mystery S monoplane *Texaco 13.*

On April 22, Captain Hawks cut in half the London-to-Rome record of Wing Commander Charles Kingsford-Smith, flying the 900 miles in five hours and twenty-four minutes. On the return flight he was forced down by inclement weather within one hundred miles of Paris. The next day, Captain Hawks broke the previous record of seventy-eight minutes between Paris and London, flying the distance of 218 miles in fifty-nine minutes.

The distance of 285 miles between London and Dublin was flown in one hour and forty minutes by Captain Hawks on April 30, breaking the previous record for the journey by approximately one hour. He then made a 365-mile tour from Dublin to Cork and Limerick, returning to the starting point two hours after the take-off.

British Air Mail Increases

AIR MAIL carried by Imperial Airways, Ltd., showed an increase during 1930 on both European lines and on the England-India route, according to reports recently made available. Ton-mileage on European routes increased from 15,433 in 1929 to 18,336 in 1930; air mail carried to India totaled 162,887 ton-miles last year as compared with 111,443 for the previous year.

Planes of Imperial Airways flew a total of 758,055 miles in 1930 on European routes, a decrease of 20,205 miles; and on the Indian route, mileage totaled 528,019 in 1930, an increase of 129,324 over 1929.

Invent Air-Pressure Device as Stabilizer for Heavier-Than-Air Craft

APPLICATION was recently filed for a patent for an invention designed to enable an airplane out of control to regain a horizontal position. The device, utilizing compressed air, would be operated by the pilot and would add approximately one hundred pounds to the weight of the plane. Ernest Laws and John Skinner are the inventors.

Set England-Turkey Flight Record

RECORDS for both outgoing and return flights between London, England, and Istanbul, Turkey, were established recently by two British pilots, Capt. Neville Stack and J. R. Chaplin after abandoning an attempted flight to Australia. They flew to Istanbul in fifteen hours and returned in fourteen hours and forty-five minutes. Engine trouble interrupted the flight to Australia. They plan to attempt another England-Australia air journey for the purpose of demonstrating the feasability of fast air mail service on this route.

Start England-Scandinavian Air Transport Passenger Services

TWO new air passenger transport services were established recently between England and the Scandinavian countries. One service brings Copenhagen within seven hours of London and the other, making more stops en route and allowing a forty-five minute halt for luncheon, requires approximately nine hours. The latter line continues from Copenhagen to Malmo, an additional half-hour flight.

These services will be operated daily including Sundays by the Royal Dutch Air Lines K. L. M., and the Belgian Air Lines Sabena. Sixteen-place Fokker monoplanes with a cruising speed of 120 miles per hour and a radius of 650 miles will be used.

In June night air mail service will be inaugurated over the route, enabling letters posted overnight in Scandinavian countries to reach London by mid-day.

FRANCE

Air Minister Makes African Flight

A 9,315-mile flight to visit the airports of North Africa was recently completed by Air Minister Jacques-Louis Dumesnil, accompanied by Captain Dieudonne Coste as pilot and five others. They covered the distance in one hundred flying hours. The party crossed the Sahara Desert from Reggan to Gao, flew most of the length of the Niger and Senegal Rivers and returned along the coastline. The Air Minister visited thirteen flying fields in French Africa and returned greatly interested in commercial flying and plans for improvement of airways.

Vote $784,000 for Touring Aviation and Private Flying Development

FOR the encouragement of touring aviation in France, the sum of 20,000,000 francs ($784,000) has been voted by the Chamber of Deputies for the year beginning April 1, 1931. It has been suggested that the appropriation be used as follows:

Subsidies for individuals for the purchase of planes or for learning to fly, $207,760; for the upkeep and improvement of landing fields for private flying, $117,600; gliding, $7,840; service connected with private flying licenses, $14,112; to encourage recruiting of mechanics for flying clubs, $5,644; purchase and upkeep of four planes to be used by the Air Ministry in the development of private flying, $19,600; aviation schools, $11,603.20; and to organize a competition for touring airplanes, $7,840.

Air Force Participates in Military Meneuvers in Tunisia

THE French airplane carrier *Bearn* and several units of the Mediterranean fleet were mobilized to participate with several air squadrons in the French military maneuvers in Tunisia, May 3-10. More than 10,000 men were used in coöperation with naval units to take part. The maneuvers included an aerial "bombardment" of Toulon.

Air Service to Morocco

DAILY air transport service carrying passengers, mail and freight has been inaugurated between Toulouse, France, and Casablanca, French Morocco, by the French company Aeropostale. Stops are made at Barcelona, Alicante, Malaga, Tangier and Rabat. This service is maintained on the Toulouse-Buenos Aires route over which a weekly air mail service is operated by the company. On the weekly service, planes leave Toulouse every Sunday, stopping at Tangier.

SWEDEN

International Aero Exhibition

AS a representative of American aviation, Capt. Frank M. Hawks will attend the International Aero Exhibition to be held at Stockholm, May 15-31, according to a recent report. The itinerary of Captain Hawks, who is touring Europe in his Travel Air Mystery S monoplane *Texaco 13,* has been arranged to permit him to fly from one of the major cities in Europe to Stockholm in this ship in which he recently established several new inter-Continent speed records. Captain Hawks, who is making a study of European air transport systems, will confer with European designers and manufacturers at the Stockholm exhibition. His Travel Air plane will be on display at the show.

GERMANY

To Make Practical Test of Junkers Jumo 4 Aircraft Diesel Powerplant

PUBLIC exhibition of the Junkers "Jumo 4" heavy-oil compression-ignition aircraft engine was made recently at the Berlin-Templehof Airport by the Junkers Werke A. G., developers of the powerplant. A Junkers F.24 has been equipped with one of these engines and will be placed in regular operation by the Luft Hansa for thorough test under actual operating conditions.

This engine was first flown in February, 1929. Since that time Junkers has carried out bench tests and flight tests at frequent intervals, gradually increasing the power at which the engine was tested. Type tests were passed in February of this year.

The Junkers Jumo 4 is of the six cylinder double-acting, vertically-opposed two-stroke-type Diesel, developing 720 horse-

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OUR plan is in no sense an experiment, but one which has been adopted by the finest business organizations in the country. It requires no traveling, for the business we want lies right in your own town and the surrounding territory. We will show you how and where to go for this business and will extend every cooperation in our power to make your position a profitable one.

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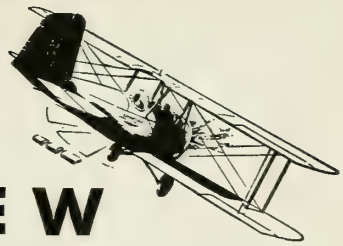
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These new tuition rates will surprise you! Write today for full particulars. Check the course you are interested in. No obligation.

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power at 1,700 revolutions per minute. Total weight is 1,760 pounds or 2.44 pounds per horsepower.

Fuel consumption at full load is 0.365 pounds per horsepower per hour. It is reported that the fuel consumption does not increase at light loads, the figures at two-thirds power being 0.347. According to the sponsors of this engine, on long-distance flights the initial weight of this powerplant is compensated for by the smaller quantity of fuel to be carried.

New Sail-Plane Distance Record

PILOT GROENHOFF of the Rhoen-Rossiten Society on May 5 set a new distance record when he flew a sail-plane from Munich to Kaaden, Czechoslovakia, a distance of 165 miles. The previous record was 101 miles, established by Robert Kronfeld.

[EDWIN P. A. HEINZE]

Seven Years of Service

A Dornier Delphin III commissioned in 1924 is still in excellent condition and doing regular service. It was first flown for a considerable time on the night line on the Baltic between Stettin and Copenhagen via Malmo. In 1925 it started service on Lake Constance, on which it has now been for six years. The ship has completed 6,712 starts. In addition to a crew of two it carries five passengers. The ship is powered with an engine of 260-300 horsepower.

Plane Building Decreased

THE Association of German Aircraft Makers recently held its annual meeting. According to the report of the general secretary, business decreased during 1930. It was deplored that the aviation industry is not permitted to manufacture military aircraft, because orders for civil transport planes alone will not suffice to keep the industry going. By cutting expenses and carefully reorganizing manufacturing processes, only a few of the German works have been able to continue with some slight measure of success. Progressive design and assiduous work have enabled the industry to compete in the aircraft export markets. But, in the long run, the association fears, it seems doubtful that the German industry will be able to compete against other nations unless the German Diet votes means for the support of aviation.

THE HINDENBURG CUP for 1930 has been awarded to Herr Schlerf of Mannheim for his service in the training of numerous young pilots. Herr Schlerf, in addition to the cup, receives a gift of $2,500. He is the unpaid manager of the sport flying section of a big club at Mannheim. He has personally trained a large number of pilots without remuneration.

THE AERO CLUB OF GERMANY recently held its annual meeting. Herr von Kehler was re-elected president. The vice president, von Hoeppner, was re-elected. The club intends to erect headquarters at the Staaken airport of Berlin with hangars and play grounds. The membership, which now totals 1,107, during 1930 decreased by 179.

THE STURMVOGEL, a German air sports union, which acquired three old Junkers passenger planes constructed in 1924, has concluded a very successful year of operation with these ships. To propagate flying and incidentally raise funds it carries out sightseeing and air taxi flights with these planes, which carry two passengers besides the pilot. During 1930, there were 2,866 passengers transported over 42,000 miles in 483 flying hours. A squadron flight took the machines a distance of 4,500 miles right through Germany in sixteen days, landings being effected at thirty airports for promotion purposes. Besides these, numerous purely local joy rides were made.

THE BERLIN sports airfield at Johannisthal, a historic flying ground formerly under the management of the local corporation, has been placed under the management of the Berlin Airports Company, a municipal enterprise, which operates the Berlin and the Berlin-Staaken airports.

THE German Aircraft Manufacturers' Association and the Luft Hansa have jointly published a German aviation year book called "Aviaticus." Numerous authorities have collaborated and the book is a most exhaustive source of information regarding German aviation in all its branches. It is well produced, very handy and concise in its text without leaving out anything of importance. It is being handled by the "Union Deutsche Verlagsgesellschaft, Berlin SW 19" and costs twelve marks.

THE JUNKERS company is developing a high-altitude airplane, construction of which is nearing completion. It is a typical Junkers low-wing monoplane with a span of almost 92 feet and a single engine equipped with centrifugal supercharger.

ORDERS for thirty new motored planes by the German Aviation Union during the first quarter of this year, exceeded by ten those for the whole of last year.

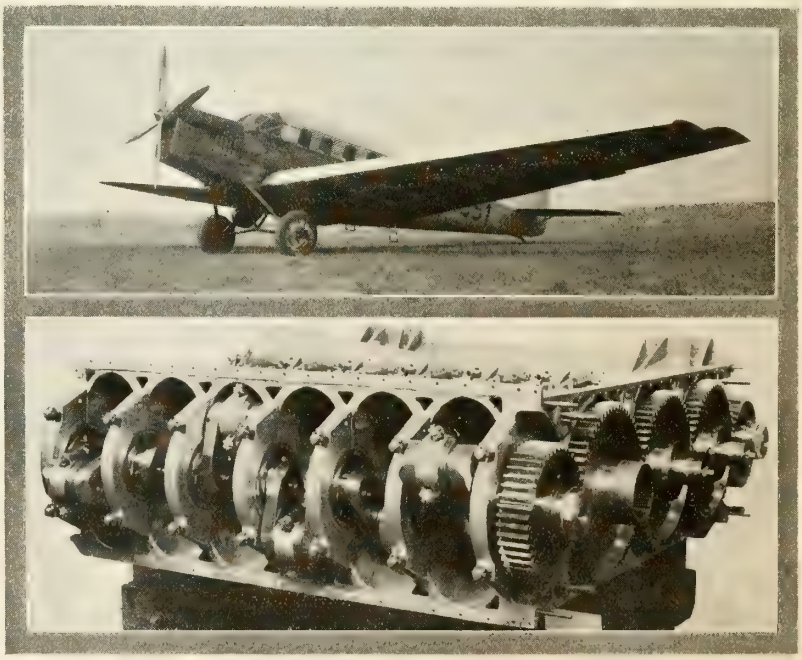
THE DEUTSCHE TURNERSCHAFT, a union with 1,600,000 members engaged in athletic activities, has decided to support the sail-flying movement and to coöperate with the German Aviation Union. An agreement to this effect is being drafted and will be presented for adoption at a meeting of the head committee of the Turnerschaft in August.

JAPAN

Starts Japan-United States Flight

A GOOD WILL flight of more than 6,000 miles from Japan to the United States, sponsored by the Tokio newspaper *Hochi Shimbun,* has been undertaken by the Japanese pilot, Seiji Yoshihara.

Flying a Junkers all-metal low-wing monoplane of the light seaplane type powered with an Armstrong-Siddeley Genet engine, Pilot Yoshihara took off at Tokio May 4 on the first stage of the flight to Numasaki, 368 miles distant. The itinerary calls for flights over the Kurile Islands to Petropavlovsk, Siberia, over the Bearing Sea to the Aleutians and the north Pacific Ocean, making several stops in the volcanic Aleutian chain, to Seward, Alaska. From there the pilot plans to fly south to San Francisco, Calif., and across the United States to Washington, D. C.



Junkers "Jumo 4" heavy-oil compression-ignition engine; (above) installed in Junkers F. 24



The Amazing Life of "TONY" FOKKER

"GOD made the world, but the Dutch made Holland." Tony Fokker, who built and flew a plane before he ever saw one in the air, who started at 19 and became a multimillionaire at 28, might have blazoned that motto on his shield. This *enfant terrible* of aviation, a temperamental enigma to friend and foe, has had one of the most amazing careers of any living man.

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BY ANTHONY H. G. FOKKER and BRUCE GOULD

Foreword by EDWARD V. RICKENBACKER

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AIR—HOT AND OTHERWISE

(*Continued from page* 49)

heart and gasoline blood. Then—well, almost all the things of aerial distinction that our Army has had to offer and most of them matters which he had had a hand in the creation of. An airman, born . . . and trained by the Wright brothers!

From the moment of fighting men's first flights in powered machines, Foulois has flown. He has just had to fly. That first fight. June 23, 1914, a captain in the Aviation Section of the Signal Corps. June 27, 1917, after we had joined the Allies, a major. In September that same year, a brigadier general, to step back, to captain's rank under peace-time reorganization. January, 1926, once more, because of his great work in aviation, again Brigadier in the Air Corps.

As an officer and an executive, this man's military experience has been definitely extraordinary. He served in Porto Rico, then went to the Philippines where he fought against the Panay, the Zebu and the Lake Lanao Moros. As an Army engineer, he was one of the four officers to do the greater portion of the mapping of the Rio Grande. A technically trained soldier, he went through the Army School of the Line and went into the Army Signal School at Fort Leavenworth, where he was studying in 1906 when called to go to Cuba with the Army of Pacification. His service there brought official commendation for his mapping methods. His graduating thesis at Leavenworth actually was the first recorded military article on "The Tactical and Strategical Value of Aeronautical Flying Machines." I have said that he flew the first Army plane purchased from the Wright brothers. With Orville Wright he was observer on the first cross-country trip made by a flying machine in the United States, an enterprise which, of course, broke all world records. That he should have been America's delegate to the International Congress of Aeronautics held at Nancy, France, in 1908, was natural. A few more details (I could write a book about Foulois) are that he designed and used the first set of wheels used on an airplane in this country and helped to pay for them when Uncle Sam was unwilling to spend more than $150.

Foulois is a believer in our citizen soldiery. He reorganized the Signal Corps and Engineers units of the organized Militia throughout the United States.

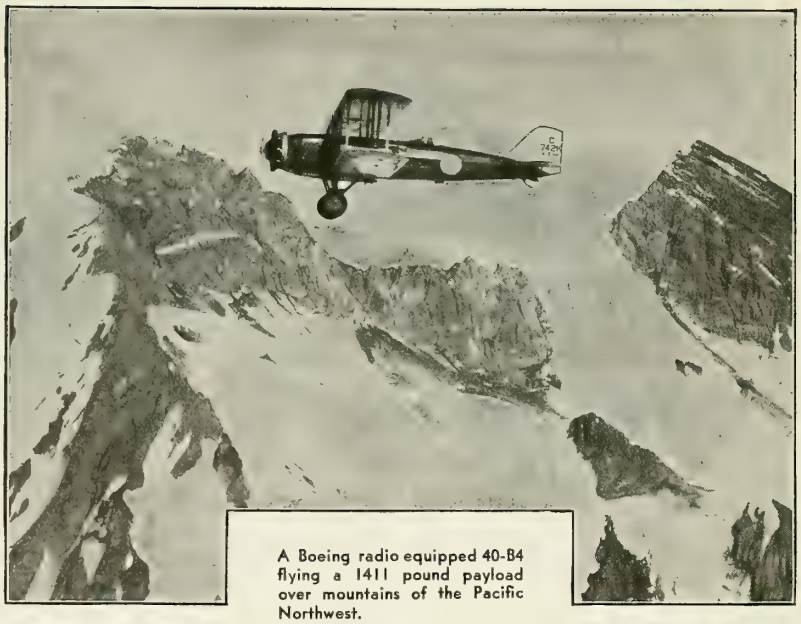
He is respected, even loved, by every man who knows him, especially by those who have served under him.

And now the point is this: General "Jim" Fechet's administration as Chief of the Army Air Corps automatically ends next December.

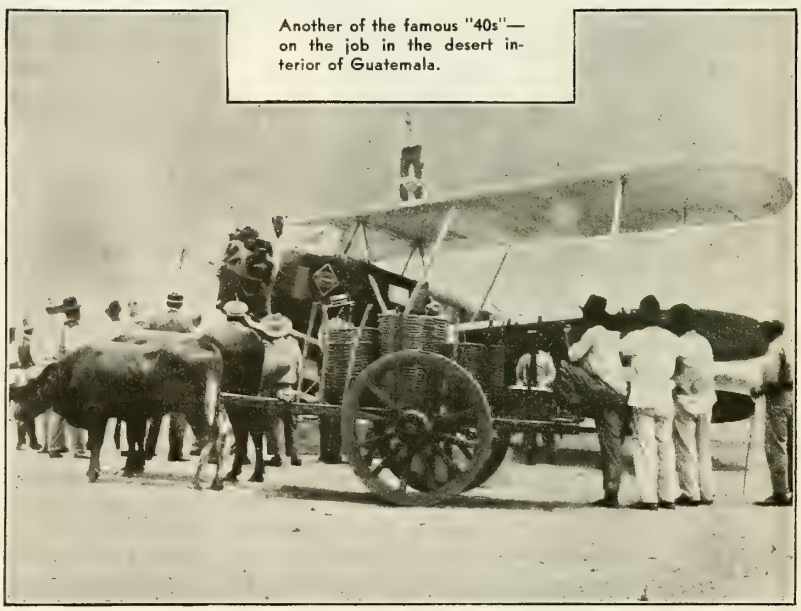
It is in line for us to say things at this moment. In August, 1927, we had the honor to suggest General Foulois' appointment as Assistant Chief. He has made good. Whenever promotion has been earned, these two men, Generals Fechet and Foulois, have seen to it that their subordinates got it. Now the promotion of Foulois has been earned as definitely as any ever has been earned.

General Fechet's job is going to be vacant. So we hereby do nominate for the job the boy who rode the bicycle out of Washington, Connecticut, who flew the Army's first airplane, and who was the presiding genius of the greatest air maneuvers that the world ever has known, Brigadier General Benjamin D. Foulois. We regret that Fechet must leave. But we are glad there is a man like Foulois at hand to sink into this important directorial chair as Brigadier General Foulois, Chief of the Army Air Corps.

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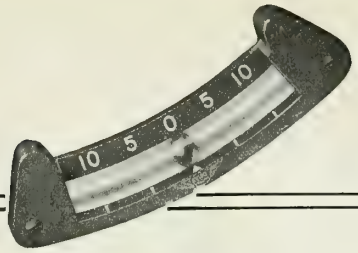
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ALTITUDE FLIGHTS

(*Continued from page* 43)

Kingbird landplane, carrying a payload of 1,450 pounds. The ship, powered with two Wright J-sixes of 300 horsepower each, was flown to its maximum altitude after a climb of one hour and a half. Several days later official tests on the barograph showed that a minimum pressure of 269 millimeters of mercury had been attained, which is equivalent to 7,780 meters, or to 25,525 feet.

On March 10, Miss Elinor Smith took off from Roosevelt Field, Long Island, New York, in the Bellanca Pacemaker used earlier by George Haldeman. This cabin monoplane was equipped with a J-6 Wright 300, with a supercharger. The young pilot, well prepared with altitude equipment, began her climb by starting in wide circles, climbing steadily through the smoke and haze of a rather warm day to an elevation of 5,000 feet. The pilot's oxygen supply was started at 16,000 feet, adjusted to give a small quantity at first, and then greater amounts as altitude was gained. It was also necessary to make adjustments of the air and gas mixture for the carburetor as the altitude increased. At the maximum altitude attained, and with the ship still climbing, the mixture was accidentally adjusted too lean, with the result that the motor misfired several times and finally stopped. To make matters worse at this critical time, the oxygen flow failed, because the freezing of moisture at the needle-valve of the oxygen flask. The pilot fortunately had presence of mind to open the valve on the emergency flask. In the meantime, however, considerable altitude was lost. Miss Smith got her motor going again and made an effort to resume her climb, but observing that the motor was not at its best and realizing that the plane would soon be out of gas, she started a glide towards earth, being careful to keep the plane to windward so as to be certain of reaching her home port in the event that the motor should at any time fail. Just after clearing some telephone wires bordering the landing field, the motor stopped, out of gas, and the ship had to be landed with a "dead stick" after a flight of one hour and forty-five minutes.

At the maximum altitude attained, the free-air temperature recorded by a small recording strut thermometer designed and constructed by the author, was —50° Centigrade ±2° Centigrade (—58° Fahrenheit). This recorder was constructed as an improvement on the minimum temperature recording device formerly used and was flight-tested for the first time in this trial. It consisted of a coiled bimetallic-strip temperature element, which, by means of a stylus, traced a fine line on a camphor smoked disk. The latter was rotated once an hour by the mechanism of a pocket watch. The entire instrument was not much larger than a man's hand. In order to keep the watch running at temperature lower than —25° Centigrade, it was necessary to cleanse the main-spring free from oil, and put some powdered graphite in place of the oil between the convolutions of the spring. The rate of the watch, however, decreased considerably at low temperatures because the timepiece which was used in this first model did not have a temperature-compensated balance wheel. Further experiments will be made with a high grade watch, in an effort to measure time accurately over the entire range.

A temperature recorder built into the base of the barograph showed a minimum temperature of —18° Centigrade (—0.5° Fahrenheit). The barograph was given a flight history test while at the temperature recorded within the barograph case. Readings taken at the maximum altitude point of the trace showed that a minimum pressure

of 247 millimeters of mercury had been attained, which is equivalent to 8,357 meters, or to 27,418 feet. This performance established a woman's world record which might have been even greater had it not been for the unfortunate incidents at the peak of the climb. The newly established record exceeded a former unofficial figure set by the late Miss Marvel Crosson, who, on May 28, 1929, attained an altitude of 24,000 feet.

On March 13, Capt. Boris Sergievsky again took off, this time from New Rochelle, N. Y., in the Sikorsky S-38 seaplane, which now carried a payload of 1,000 kilos. As before, the ship was equipped with two supercharged Hornets. Oxygen was used only during the latter part of a one-hour climb. The total time required for the flight was one hour and thirty-six minutes. The barograph carried in the ship showed a minimum pressure of 298 millimeters of mercury, which is equivalent to 7,078 meters, or to 23,222 feet. Another world's record was established, this time for a seaplane carrying a payload of 1,000 kilos.

On April 2, Edward A. Johnson took off from Vandalia, Ohio, in the so-called motor-glider "Buzzard" which was powered with an A.B.C. Scorpion motor of thirty-four horsepower. The ship is a light plane in the first category. The climb required one and a half hours and the descent about forty minutes. Tests made on the barograph showed that the plane had attained a minimum pressure of 407 millimeters of mercury, which is equivalent to 4,863 meters, or to 15,955 feet.

On April 11, Herr Fusbahn and his wife, of Germany, made a record flight at Boblinger-Wartemberg in a Klemm L.25 monoplane with a Salmson motor of forty horsepower. With this light plane, a two-seater weighing less than 200 kilos (441 pounds) and classed in the second category, they established a world's record by climbing to a minimum pressure of 421 millimeters of mercury, which is equivalent to an altitude of 4,614 meters, or to 15,137 feet.

On April 21, Pilots W. Voight and K. Gaube, again of Germany, made a successful flight at Darmstadt in a light landplane of the first category, a two-seater weighing less than 400 kilos (881 pounds). The ship, an Akademische Fliegergruppe Darmstadt D.18 was powered with an Armstrong-Siddeley Genet motor of 100 horsepower. A world's record was established. A minimum pressure of 279.5 millimeters of mercury was attained in flight, which is equivalent to 7,521 meters, or to 24,675 feet.

On May 23, Woldemar Voight of Germany made another flight, this time alone, in the same ship. This plane was now classified in the third category—that is, a single-seater weighing 200-350 kilos (440-771 pounds)—and was powered with an Armstrong-Siddeley Genet motor of 100 horsepower. Again he was successful in establishing a world's record. The minimum pressure attained in flight was 255 millimeters of mercury, which is equivalent to 8,142 meters, or to 26,712 feet.

On the afternoon of June 4, Lieutenant Apollo Soucek, U. S. N., again made an altitude attempt at the Naval Air Station, Anacostia, D. C. The ship used was the Wright Apache landplane, which had recently been recovered with fabric and equipped with a new Pratt and Whitney Wasp engine of 450 horsepower. The engine was supercharged with a Root's type supercharger. At this particular trial I served as the official observer for the National Aeronautic Association. The day was perfect for altitude flying with a cloudless sky. Two Friez dual-traverse barographs were sealed and suspended from heavy rubber bands within the barograph compartment of the ship, located just back of the single cockpit.

(To be continued in the July issue)

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CRADLE OF GERMAN AVIATION

(*Continued from page* 51)

the country are maintained by the Luft Hansa alone. There is also the North Bavarian system, comprising more than twenty airports at various cities in a restricted area. There are lines in northern Prussia and East Prussia. The hitherto most inaccessible parts of the republic can now be reached by regular airlines, all maintained at a high standard of perfection. The Germans, who have been, since the dream of Count Zeppelin in 1860, pioneers in aviation and even today lead the world in the operation of motorless planes, are probably the most air-minded race in Europe.

A visit to a German airport gives one an impression of prosperity. American fields are only beginning to approach the stage of efficiency in evidence at every important landing field in Germany. With machine-like regularity the planes come and depart, passengers and their friends meeting at the typical German beer garden, on arriving and departing. The handling of baggage and the servicing of the equipment is here, if anything, a much cleaner and less bothersome process than when traveling by railway trains.

INVENTION TO THE RESCUE

(*Continued from page* 48)

chambers for containing light metal helium containers, that with the hot air exhausts of the multiple engines connected into the inflation chambers for to aid inflation support and FOR TO CREATE AN EQUAL PRESSURE OF HOT AIR SURROUNDING THE HELIUM CONTAIN-TAINERS TO THE PRESSURE IN THE HELIUM CONTAINERS WHICH PREVENTS OSSMOSSIS, a kiudle name for escape of gas.

"Visualize geegantic flat bevel edged deerigeebile units 1,000 foot in length, 500 width, 30 or 40 depth with central hulls having power plants and electric generators with connections to the tubular power supply pipes supporting the engines and propellers supported on the vertical masts and with stays to hull framings with governer pendulem valves for automatic control for stabilization, and the engines with solonoid valve control with electric conduits connections to pilot houses, controlling the multiple engines operation on each unit by electric conduit switchboard, control, and synchronous conduit control from the main pilot house on the helicopter hull.

"Visualize the metal halyards containing all the dirigibles together forming a combination of units, then the fleet of 200 aeroplanes each with their passenger of 1 pilot and 6 passengers, 1,500 passengers on the aeroplanes and crews of these dirigible garages, that of course should two-thirds of these aerial garages fail to function will still be safe with the other third of the aerial garages, but the aeroplanes can take off if the passengers become nervous, also use the parachutes, and of course a fleet of dirigibles, of smaller single unit size may also be carried on the upper decks of this dirigible hangar combination garage.

"Visualize these giant dirigible garage units 1000 x 500 x 40, on masts of giant size extending up vertically from the Jules Vernes, and Frank Touseys, Frank Reads helicopter hull in flanged sections for 360 foot with 56 multiple 500 horse power pressure engines with supply pressure power from the power plants on each hull, supplying 28,000 horsepower each on each hull, operating 40 lifting engines and propellers and 4 steering propellers on each hull, and 12 driving propellers on each hull which, combined, provides 1,200 tons lifting capacity, 120 tons steering, and 360 tons driving capacity.

"Visualize the combined weight of all contained 1,800 tons and the lifting inflation combined capacity 1,800 tons which is balanced on the ground, and the surplus engine power plants and propellers capacity of 1,200 tons, lifting, 120 tons steering, 360 tons driving for navigation, ¼th 300 tons for aeroplanes and their passengers and crews, and the crews of these combined dirigible garages, 1,400 passengers and crews with all freight stores fuel and all contained, similar to steamships, but of light metal construction, and you have a vision of this combined aerial dirigible garage combination aeroplane hangar airships that can rise and land vertically anywhere on land or water, or hover over, and travel at 300 to 500 miles per hour. And of course I have figured ¼th of the lifting capacity of 1,200 tons for passengers and freight, but 600 tons may be utilized if desired ½ of the surplus lifting capacity. All this bunk is in the patent application, yours truly, Hugh T. Dunn."

And if you can visualize all that you've got an eyefull. As an afterthought, apparently with reference to the all-metal dirigible manufactured for the Navy, the inventor added: "Them Bozozoes cannot construct that tin bubble of larger size without infringing on my patent claims, and them bozozoes will have something to think over, and I have sent this Fritche the same bunk, and sent these plans broadcast for the last 30 years, so you will find that they are known some."

Another inventor, Wilhelm Schwefler, of Berlin, Germany, writes as follows:

"The problem of gravitation is solved. The construction of airships for general traffic now possible. Capital is

(*Continued from preceding page*)

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(*Continued from preceding page*)

sought to construct models and to establish and develop a modern air traffic enterprise with construction plant.

"I have spent 19 years in solving the problem of gravitation. At last I met with success. The cause of the wandering of comets being known today, flying objects may be moved by the same power that moves the comets. This knowledge offers excellent opportunities to aviation for the following reasons:

"The new flying method requires no gas or motor for starting, flying or landing the new air craft, as all of this is accomplished by employing, increasing or decreasing those powers that are to be found in the universe. The powers are available at any time. Since I understand thoroughly to apply these available powers, I am wholly able to construct a new kind of air craft to be moved by these powers. To finance an adequate enterprise the participation of a group of capitalists is invited."

It is indeed cheering and refreshing to learn that the problem of gravitation, long a knotty one, has been solved by this genius. I began to despair of its ever being done, but I needn't have worried. Mr. Schwefler has been on the job for the past 19 years, and now hurls his invention at a gasping world through the medium of my department, with—I hope—stunning effect upon my six readers. He continues triumphantly:

"I have solved the problem of the ship of universe, which power bases upon gravitation, but not in the way that rockets are used as driving power, but the raw natural power, which drives the comet to the sun, is used as driving power. Rockets would be in question only for steering, but only then, after the atmosphere is discovered thoroughly on account of its contents. I fear, that it looks entirely different from what the scientists are teaching us at the present.

"It is possible to build a 'ship of universe' which is able to fly independent of air currents and air compression. If you look at a comet, it flies to the sun, flies around it, and then flies to another star, and this repeats itself.

"The comet consists of the mantle and the kernel. The mantle produces the power, and the kernel directs this power. This power you can develop and suppress, and with this the construction of the 'ship of universe' is assured.

"In my model these facts are practically provable, as well as you can draw electricity out of a kettle. I would not talk about the growing of these powers, also of the sun power, because it is a so-called business secret.

"Of which commercial meanings only the facts are, to know the moving power of the comets and imitate same, is absolutely clear, and only through this knowledge you are able to build 'ships of universe' which are safe. That these ships will develop an enormous speed is also clear and this speed can be increased and decreased.

"By these 'ships of universe' is only the mantle, the part which develops the power. The other room can be fully used for transportation of people and freight. Also any other aircraft can be equipped with my invention to prevent the possibility of falling down. On account of profit, I only need to say that it is a competitive less undertaking that the world has ever known."

There you are. All we have to do is to capture the natural power that is in a comet's tail, which the inventor claims he is able to accomplish. I certainly hope so. It is a thing that I have longed to do myself, for years and years. Once I thought I had succeeded and actually had a comet by the tail. But it turned out to be some of Elliott White Springs' corn likker.

My trouble in this treatise is not in picking out radical inventions for those dissatisfied with our modern airplanes, but in knowing where to stop. I have many more, all good, and some actually superlative. For instance, there is the one-man-power helicopter, picture of which is presented. It was accompanied by an eight-page description written in some foreign language. That is to say, the words, considered individually, were English, but collectively the result was foreign. At least, I could make nothing of it until this one paragraph when the inventor, a Mr. Rehbock, said:

"From the foregoing it will be appreciated that there is produced an air craft having certain capabilities of movements of wings and control whereby a human being may propel himself to rise, advance and descend, as well as to guide the movements in the air. These capabilities are so varied that a description thereof cannot be accurately given for the reason that different users may employ the device in different ways. However, certain fundamentals will be set forth."

Instead of which, however, the language went foreign on me again, so I'm as much in the dark as ever. But ignoring the technical description and glueing my eyes on the sketch, it seems reasonably certain that the aviator pedals with his feet, turns cranks with his hands, revolves a windmill, and wears a helmet and goggles. All else is pure speculation.

I feel that a fitting end to our treatise is contained in this poem—I believe it's a poem—from a Mr. Peters of Houston, Texas. I wish all these folks knew each other. What a time they'd have!

"Its music is in the ripple o' its tiny waves,
And the cymbal, if you listen, you'll hear.
'Tis this: Leaping Skyward of Bass. To rear
In flashing sun's ray, its silvery beauty plays.
"E'en as darkness approaches Poe's dream,
(That poor heart nothing fearing) plainly hearing
As twilight breaks into nite; a sound, as steam
Escaping from volcanoes, my ear tells 'tis nearing."

There's more to this, but why continue?

EXPERIMENTS WITH ROCKETS

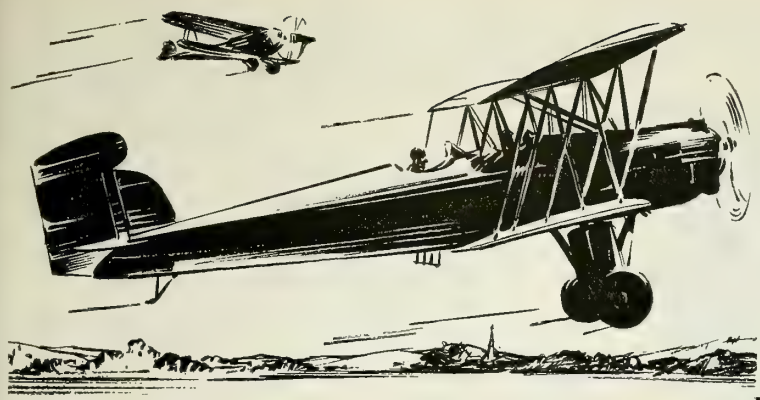
(*Continued from page* 40)

age. This inventor still employs powder rockets, but he admits they would hardly do for long distance work. Thus it appears a connection between Tiling and Dr. Heylandt would prove a good one, and possibly it may one day be effected.

The work of the other rocket experimenters in Germany does not appear nearly so advanced as that of the three groups mentioned. However, in view of the secrecy observed by all these men, it is not impossible that surprises are yet in store.

Many illusions still exist regarding rockets, and it is just as well to dispel them while on the subject. The power output of rockets is not comparable with that of a gasoline or oil engine. One cannot properly say it develops such and such horsepower. Of course, it is possible to calculate the output as has been done by fitting rockets to cars and observing the performance. But in such a comparison the rocket would fare badly, for it is not meant to supersede or even compete with the normal type of motor in the lower atmosphere, where it would use an inordinate amount of fuel to obtain a comparable performance. A rocket is meant solely for use in the highest strata of the atmosphere,

(*Continued on following page*)



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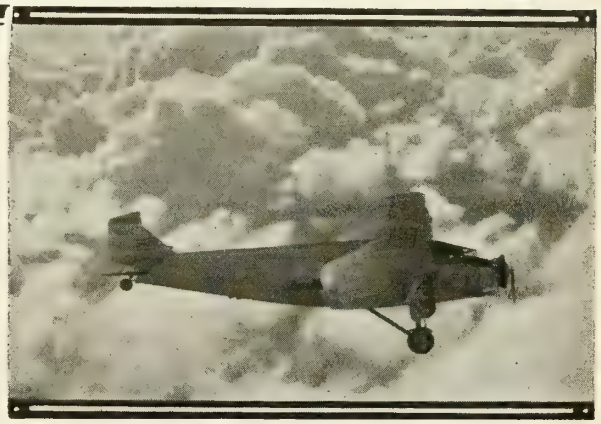
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(*Continued from preceding page*)

say above 50,000 feet altitude, where a gasoline engine could not develop sufficient power for want of oxygen or a propeller find sufficient grip on the rarefied air. It is at these altitudes, where the rocket, entirely independent of atmosphere as it is, begins to be truly economical, for here, owing to the absence of air resistance, the charge that on the ground would propel the machine only a short distance at a low speed, gives the body in which it is installed an enormous impetus. The constructors of rockets consequently do not give a horsepower figure to indicate the propulsive force or recoil, but measure the force of the latter in pounds. Thus the rocket made by Dr. Heylandt and weighing slightly over eight pounds has a recoil or propulsive force of 264 pounds, which is constantly exerted as long as the discharge continues at full fuel feed.

Unfortunately none of the German inventors will disclose anything of the interior constructional details of their rocket designs. Another of the Heylandt rockets, weighing 16½ pounds and emitting a maximum propulsive force of 440 pounds, was recently demonstrated in a car. It is fed by liquid oxygen and gasoline, both fluids being conducted through separate pipe systems into the body of the rocket, where they are vaporized, mixed and ignited by a spark plug such as is used in motor cars. A single spark suffices, after which the rocket will continue to burn of itself. Heat between 1800 and 3600 degrees Fahrenheit is generated, necessitating the employment of special metals. These are efficiently cooled, by means of surrounding the combustion chamber with a jacket through which the intensely cold liquid oxygen flows prior to being vaporized. A high factor of safety and the possibility of controlling the mixing ratio is obtained by keeping the two liquids separate until used and providing means for the separate control of their feed.

LOS ANGELES COUNTY PLAN

(*Continued from page* 58)

"The location of these necessary open spaces also has a direct effect upon the construction of airports which must neither interfere with them unduly, nor be made too inaccessible by them."

A second survey dealt with weather conditions. It was comparatively easy for the engineers of the Commission three years ago to locate airports by taking into consideration everything but weather. When Mr. Hall went into the field to gather scientific meteorological information at various points throughout the County, he discovered to his amazement that with two exceptions weather information was gathered mostly through guesswork or else records were kept so haphazardly as to be practically without value for comparative purposes. Points not half a mile apart failed to agree on wind velocity, cloud formations, visibility and fog conditions. Many of the first reports to the Commission were affected by the desire of certain communities to receive a favorable rating by the Regional Planning Commission regardless of the truth of weather conditions at their particular airport. It was discovered that no two airport meteorologists or airport managers agreed on the same definitions in reporting weather information.

Conferences were immediately held with officials of the United States Weather Bureau in Los Angeles, meteorologists of the large air transport companies, and H. R. Wills, general manager of the Los Angeles Metropolitan airport, who kept various daily records of atmospheric conditions. Finally after several revisions, Mr. Hall drew up a chart in November, 1930, that defined weather of the kind that would be of especial importance to air transport operators and also in the final location of airports. The Regional Planning Commission agreed that if unusual and unfavorable atmospheric conditions appeared at a certain location where an airport is now planned, the site would be changed.

The four weather readings—fogs, ceiling, wind velocity and visibility—were spaced on one large sheet of paper so that observers will be able to distinguish at a glance the maximum, minimum and average recordings of reports for any one locality. Ten airports and stations reporting to the Commission have been selected so as to cover the entire County in a manner that will disclose the path of inclement weather as it comes in from the sea at Long Beach and San Pedro and progresses northward to the San Gabriel mountains. These ten stations, shaded in on the map, are as follows:

Capt. T. C. Wilkinson, American Aircraft Corporation Airport; Howard T. Leech, Baldwin Park; John Burnely, Burnely's Airport; Major C. C. Moseley, Grand Central Air Terminal; Los Angeles Municipal Airport; Long Beach Municipal Airport; Marine Exchange, San Pedro; H. R. Wills, Metropolitan Airport; Lt. Duff Wilson, Santa Monica Municipal Airport; Fred Denslow, United Airport; J. J. George, Transcontinental & Western Air Airport.

The accompanying comprehensive airport development plan map shows a proposed major air terminal site in the arid region north of the San Gabriel mountains; Mr. Hall explains that it is the one location in the County absolutely free of fogs or poor visibility the year around. Observations are not being made there as climatic conditions are known. It is the belief of the Commission that the development of a major terminal there will be of great assistance to air transport companies and the War Department. Airplanes will be able to take off or land there practically any day during the year. Fighting craft would be ably protected from coast shelling by the high range of San Gabriel mountains between it and the sea coast.

It was the belief of the Regional Planning Commission that by defining every weather condition as shown on the chart, arbitrarily, the reports to the Commission would not be discrepant. As a result of their plan meteorological information concerning the entire County will be available at any set time, Mr. Hall declared. Readings are made every twenty-four hours, that is at midnight, 6 a.m., noon and 6 p.m. The charts are for daily tabulation divided into monthly cycles. The first of every month the charts are sent to Mr. Hall for tabulation and filing. Test charts were sent out for the month of December in order to give meteorologists an opportunity to become acquainted with the system and to make any suggestions to improve the system.

The definition of fog on the chart—"Fog—Shade chart whenever ceiling is 500 feet or less, and horizontal visibility is one mile or less—" was chosen by Mr. Hall because air transport operators are mainly concerned with atmospheric disturbances below 500 feet, which prevents airplanes taking the air. The Planning Commission realizes that such a definition does not connote fog in the true meteorological sense of the word. The fog readings are made every two hours as only by a close check may any data of importance concerning such conditions be ascertained. The rectangle graphs were decided on only after many other types were tried and found lacking in several respects. By merely blocking in, the average of all four charts is seen at a glance.

At the conclusion of the first or trial month test, J. J. George, meteorologist of Transcontinental & Western Air,

(*Continued on following page*)

Wasp—Hornet—Wasp Junior

Engines

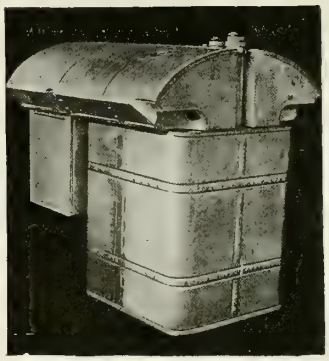
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(*Continued from preceding page*)

suggested that six Sling's psychrometers be distributed at strategic points so that relative humidity, dewpoint and temperature might be determined. He believed these readings should be made three times a day, at noon, 3 p.m. and 6 p.m. This suggestion was well taken by the Commission and action will probably be taken to make possible these readings. At least, they will be given from the major airports where meteorologists are stationed, as equipment there is already installed. Mr. George points out that with the psychrometer readings it will be possible with a chart of a one-year cycle to practically name from twelve to fourteen hours previously the particular spot in the County where fog will form. Prediction of a fog under these conditions will be 90 per cent correct, declares Mr. George. It is believed that readings will be spread so that in addition to the airports already named, psychrometer readings will be made at the Santa Monica Municipal Airport, Long Beach Municipal Airport and Kellog field at Pomona, the latter being situated at the Eastern edge of the County.

Being able to forecast the presence of fogs coincides with the general airport plan of the Commission. It is their wish to be able to predict inclement weather approximately six hours in advance. By this method it would be possible for an air transport company to "spot" a plane at an airport that will be free of fog if indications are that its own airport will be "fogged in" at the scheduled time of departure. Mr. Hall also explained that while the seventy-one proposed airport locations have been tentatively determined, these can be changed if the results of the weather survey show clearly unadvantageous meteorological conditions. Mr. George sums up his views of the development plan and incidental weather survey in the following words, which carry out the expressed feelings of the entire industry in Los Angeles County:

"The fog survey of airports which the Los Angeles Regional Planning Commission is making, incidental to their plans for Los Angeles' future airport growth, will not only prove valuable from their standpoint of choosing the best situated sites, but it will carry immediate benefits to the air transport companies operating within the County and to any flier who operates in the Los Angeles County area. This survey will undoubtedly prove of immense value especially to airplanes operating out of the County on a schedule calling for their departure at an early hour in the morning.

"Through the process of making graphs of humidity and temperature readings from the various airports which are included in the survey, and also from the records of the distribution of fog on the following morning, coupled with the pressure distribution from the weather map, it should be possible to accurately forecast the time of formation, dissipation, ceiling, and distribution of fog in the Los Angeles area. The value of this forecast to any air transport operator is apparent."

In direct connection with the airport development plan, the Planning Commission has recently drawn up plans for a Los Angeles County Airport at the insistence of the Board of Supervisors. Various interests have urged a County Airport and several sites are now under consideration. One especially large piece of land offered the Supervisors is near El Monte, towards the Eastern boundary of the County. Prerequisite to the Board's consideration of a piece of ground, is an area of nearly a mile square as members have unofficially declared that the airport when completed will be of major importance and will be as great a development as the famed Los Angeles and Long Beach harbor. Preliminary plans drawn up by the Planning Commission of the El Monte site call for separate landing and take-off areas. The take-off area fronts the depot and the hangars for serviced aircraft. It is 5,600 feet long by 1,000 feet wide. The landing area is 3,800 feet by 3,300 feet. A supplementary take-off runway between the two large areas running east and west is 5,000 feet long and 600 feet wide. Space for a grandstand to take care of air-meet patrons situated midway between the landing and take-off areas and affording an unobstructed view of both landing and take-off areas is provided. A large area completely separated from either the take-off strip or landing field is reserved for either for use of lighter-than-aircraft or as revenue property. Any definite decision in regard to a County Airport will not be made, however, until the fog survey at least is completed, members of the Board and the Planning Commission declare.

This anticipatory project of Los Angeles County has been brought to the attention of the United States Weather Bureau officials in Washington and Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, and it is entirely possible that a national coöperative plan along the same lines may be worked out. Meanwhile it is within the province of every community, every city and every state to seriously consider its possibilities.

FLYING ARTILLERY

(*Continued from page* 39)

was not attempted in the Panama experiment. The reluctance of airmen to land ammunition is well-known but it would seem that modern types of high explosive projectiles are quite able to stand the shock of ordinary landings without danger of detonation. Ammunition planes might be fitted with a drop floor by means of which, in emergency, the explosive load would be dumped.

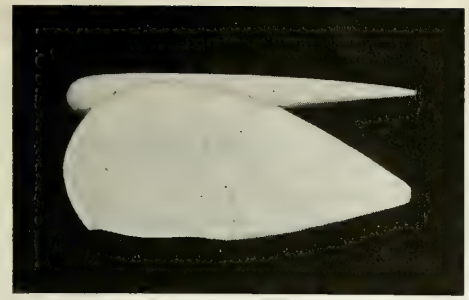
This experiment is certain to excite comment and arouse thought in a new direction. Like all pioneers, Battery B, Second Field Artillery is unaware of the ultimate significance of its adventure. Unquestionably, this flying battery has initiated an idea which other commands will sooner or later carry on and develop.

As a corollary to the flight a more definite realization has been reached of the type of field artillery which is required for use in the defense of the Canal Zone. War in Panama might conceivably be fought either on the Pacific coast, where there is open country and some road communication, or on the Atlantic coast or in the interior, where only narrow, mountainous trails exist. These varying conditions of service require varying degrees of mobility of the artillery. For jungle fighting, mule transportation is indicated. For fighting in open areas where roads exist, truck transportation-portee would lend greater mobility. For emergency use, air transport would be invaluable.

The present howitzer of the Second Field Artillery is ideal for any one of these methods of transport. All that is required is the adoption of this idea of elasticity of transportation in Canal defence plans, minor changes in the present Pack organization to fit the needs of gasoline transport and availability of accessories for motor or air transport.

The Battalion should, while organically Pack Artillery, be equipped for any kind of transport, and should not limit itself in its training to concentration on pack transportation. It should be a unique organization, not wholly animal nor motor, adaptable in training, equipment and in mental attitude.

Such trains of thought has some obscure B Battery private, with his idea of transport by air, set in motion.



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MERCHANDISING AIR TRANSPORT

(*Continued from page 60*)

established, the Postal Telegraph is undertaking to help merchandise this service for the airline. Its commercial engineers are making a study of markets for air express. Its commercial agents or contact men are being trained in a school of transportation and are being prepared to go out and discuss shipping problems with customers. Arrangements have been made to utilize its means of quick communication in tracing and controlling traffic movements. If, for example, its representatives contact a shipper who has an urgent shipment, but cannot ship because the consignee controls the routing, a representative is available at the receiving end to get in touch with the consignee and get his instructions to ship by air.

Their messengers are being trained to look out for express shipments. They are circulating during the busy shipping hours among the garment manufacturers, the film distributors, the florists, handing out literature on air express and picking up late orders that miss the afternoon collection by bus or rail express. They are available for shipping houses that work late into the night and who want to get shipments under way before the next day's orders are begun. The representatives of the company work twenty-four hours a day.

At first blush the entrance of the Postal Telegraph into the air transport field seems quite novel and the community of interest between the business of communication and air transport might be questioned. The short test, however, has demonstrated the mutual advantage in their cooperation and its effect on air transport is already apparent.

THE SNAILS OF BAGDAD

(*Continued from page 37*)

ican to restore a typical Model T to running condition. Another manufacturer of the same sort, Mr. A. O. Smith of Detroit, admits that he can get out of an unprofitable business faster than anybody else in the world. And none other than the Prince of Wales recently told the English industrialists that one of the secrets of our economic success is the fact that Americans are willing to try anything once and throw it away if they don't like it.

If we graybeards could trust and encourage the younger generation to do the same with our political and economic theories and practices, the world would move much more rapidly toward a decent destiny. The sick snails, of course, would stay behind to die in undisturbed dignity. But the wings of progress would be taking off from a field free of the infections of prejudice, habit and traditional stupidity.

I have been reading lately the history of lighter-than-air craft, as it is told in "Cruisers of the Air," by C. J. Hylander, published by Macmillan. It is a swell yarn, packed full of facts and fascinating stories. Not many books on aviation have done such a thorough job. It surveys three centuries and doesn't miss a balloon, blimp, dirigible or day-dream on the way.

Its lesson to the layman reader is not merely the possibility that dirigibles may some day play the part of tortoise—old, slow and sure—to that rapid rabbit, the airplane. The author likes his balloons, of course, and expects much of them. But the yarn is illuminating because it shows that wild ideas were all the aeronautics there was, in the earliest days of our art and science. It was a bold and independent spirit, for instance, who first supposed that a bag full of hot air might rise from the ground, and a bolder one who first undertook to ride in one. And for a full century and more the progress of aerostatics consisted of extraordinary speculations that are now so simple that a child can comprehend them. It doesn't seem difficult today, for example, to see that a rigid framework filled with gas cells is superior to a monumental sausage for transportation purposes, but Count Zeppelin was a bold and original thinker when he worked it out. The monument to his genius is now nearly ready to take to the skies at Akron.

The pluggers play their part, indeed, by consolidating the territory won by those who travel on the three-league boots of speculation. But nearly always the dreamers must do their stuff, before the practical men have much to work on. And sometimes there are badly needed those who will ignore precedent and experience and start a brand new notion which nobody had suspected before and which hardly anybody thinks is worth working at. This is the other element in evolution, which is commonly neglected by those who discuss evolution. And evolution, as you know, is nothing but a description of the curious way in which one thing leads to another, which would travel at a snail's pace unless it occasionally sprouted like a skyrocket in a totally unexpected direction.

So if any of the bright boy graduates of 1931 have a lunatic notion for setting the world to rights, don't let the neighbors discourage them too soon. If the idea is wrong, it will provide its own discouragements. Let's give the boys a break, admitting meanwhile in the privacy of our own conscience that they can't make much more of a mess of things than their elders have done.

That being settled, we might consider a moment the recent developments in the dirigible field, with which British policy has also something to do. It isn't fair to say that the British dislike of diseased snails is responsible for the shut-down on airship construction in England, though there have been times in the past when English experiment has halted in its tracks because of too many minor discouragements. Usually the real reason has been that British development has been plodding too far in the rear of the rest of the world and has invited a lot of unnecessary trouble. But the disaster to the R-101 was too much of a wallop. I doubt very seriously if this country could stand one like it and continue the development of dirigible experiment and construction.

It did not represent an ordinary setback or even a series of discouraging failures. A football team might continue to fight, even after three plays had failed and the fullback had punted over his own head. But if practically the whole team had been put out of the game, it would be necessary to call time out. England, to the world's sorrow, lost its very best lighter-than-air experts in the crash of the R-101. There is nearly nobody to carry on with any assurance of success. There is nothing to do but wait and rebuild the team.

But it would seem to be a big mistake to allow this decision to discourage progress on this side of the Atlantic. Something to that effect was heard from those of faint heart and fair-weather courage when the British policy was announced. There were those who said 'I told you so.'

But the result of England's withdrawal for the present from airship competition increases the responsibility of this country. Somebody must discover the goal of three centuries of ambitious effort in lighter-than-air. And if it can't be done here, it probably won't be done anywhere. The best abilities of several nations have been concentrated

(*Continued on following page*)

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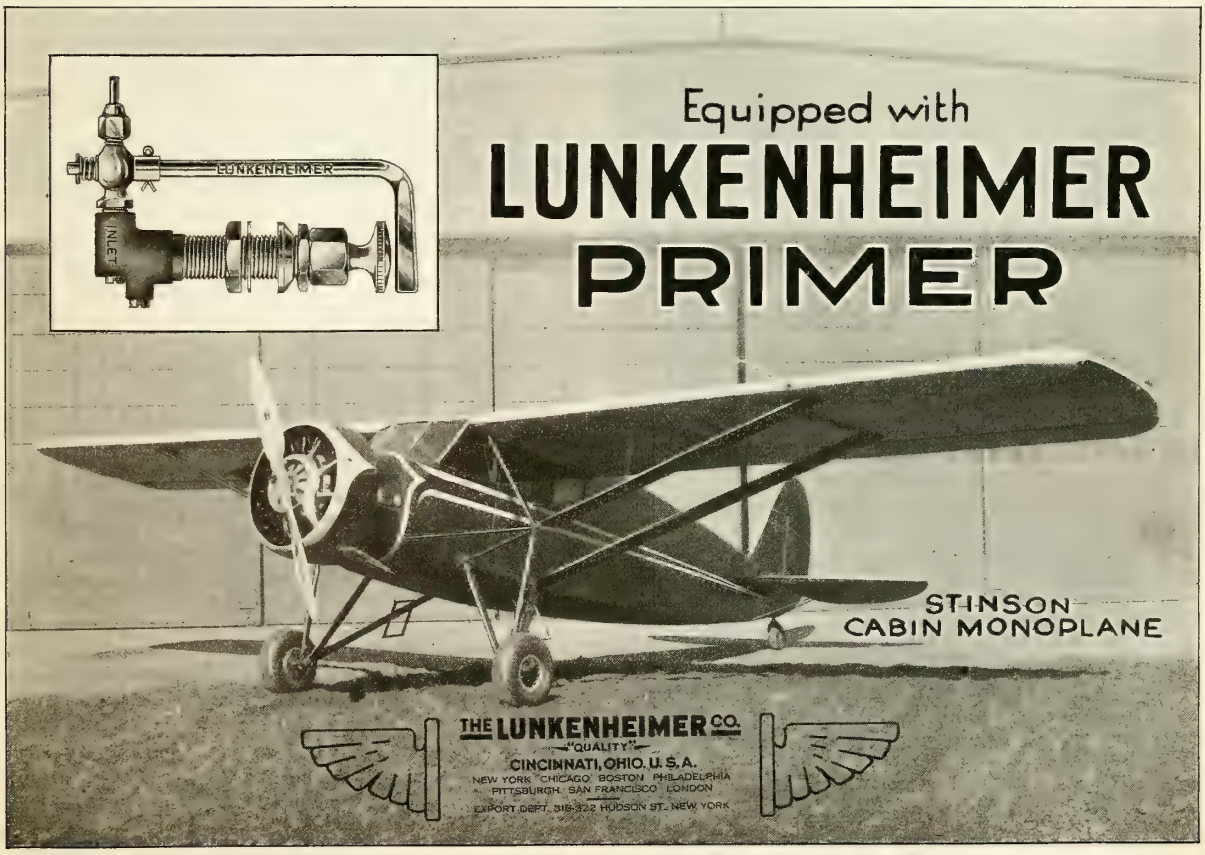
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(*Continued from preceding page*)

here for the building of our airships. This country holds the helium that is now recognized as a practical necessity for airship operation. Money is promised for commercial operation, if some government aid is available, and the great spaces of the American continent and the two oceans that surround it are just what a dirigible needs to make itself useful. If airship operation is to be successful anywhere in the world, it must prove it in the safe and reliable operation of the giant now nearly ready for the air in Ohio.

Premier MacDonald said of the disaster to the R-101: "The men who had the spirit, skill and experience practically all perished." So the friends of aviation in terms of lighter-than-air must depend now on what this country can do. The spirit, skill and experience are here. The money and materials are available. And the big ship is nearly ready to go.

A while back I dropped the casual remark that I had written a book. My natural modesty makes it practically impossible for me to discuss this indiscretion, but I am resolved to sacrifice myself to the curiosity of the customers. The advertising rates in this publication are extraordinarily reasonable, of course, but there's nothing like a little editorial comment to help an indigent author. And if I shouldn't talk about this book, who should? Also, try and stop me.

I wrote this book, as a matter of fact, in collaboration and coöperation with Señor Juan de la Cierva, the distinguished inventor of the Autogiro. He provided the ideas and I wangled the words, and I assure you that one would be unprintable without the other. The consequences are called "Wings of Tomorrow" and are published by Brewer, Warner & Putnam.

The book has only a slender plot, a minimum of literary importance and practically no sex appeal. But it has been a useful and enjoyable experience to write it, and I propose to tell you why. It has taught its unworthy co-author that a real comprehension of what aviation is all about is only achieved in the sweat of the brow and the stench of the midnight oil. It has taught him to respect the studies of engineers, the long lessons of experience and the slow patience of science. It has convicted him of talking glibly on occasions concerning matters which he knows nothing about, and convinced him that this is also done by those who should know better. And it has fundamentally refreshed and restored his faith in the future of aviation.

Lately I visited one of the model clubs of my home town and found hundreds of small boys at work, designing and building with infinite patience the airplanes that pleased them most. Something in their mood and manner warned me to keep my aerodynamic mouth shut. They were dealing with certainties and possibilities, not with speculations and prophecies. They were a sober crew, not much impressed by journalistic visitors. They were really interested in aeronautics, not merely talking about them.

I acknowledge the same impression of the real workers in aviation, from dealing first-hand for a season with one who knows the why and wherefore of the flying wing and what the world will someday do with it. And for this reason I have somewhat less patience than usual with the snails of Bagdad, who really know nothing about aviation except that they can't get used to it. They had better move over and make way for the wings of tomorrow. Or else tomorrow will be bound to ignore them and take off from a base of its own, leaving them to enjoy their bilharziasis and schistosomiasis and eventually die of it.

PROBLEMS OF THE ENGINEER

(*Continued from page* 41)

realm of pure science. These men are the ones who are shedding light on fundamentals which may be our salvation. Often the greatest progress has been obtained by analogy so that a widespread point of view on what appears to be irrelevant subjects will be the cause of discoveries and innovations of immediate importance. One of our most important recent improvements involving the principles of reducing drag by eliminating turbulence was discovered when experiments on a quite unrelated investigation were under way. I refer to the experiments of Mr. Townend in England. It is also interesting that Doctor Reed first had his attention called to the possibilities of the metal propeller when carrying out his researches on matters pertaining to acoustics. We must, therefore, watch the scientists and inventors and carefully and impartially study the possibilities of innovations. Although lasting progress is always by a curve of gradual slope, nevertheless, it is frequently changed in pitch by spurts brought about through radical departures, in other words, minor revolutions in the general evolutionary process.

Specifically, the elements of our slogan, speed with safety, comfort, reliability and economy, are inter-dependent. The following exemplifies this idea.

Speed promotes economy of operation as the fastest plane will be least time in the air for a given journey. By the same token safety and reliability are enhanced in the plane of excelling speed.

Safety creates a larger market with attendant increase in production and decrease in cost.

Comfort is inter-dependent with the same qualities as is safety.

Low first cost creates a larger market, giving greater production and still lower first cost.

Therefore, we must strive to unite all qualities of our slogan into our successful commercial airplane. In my own opinion, (and granting that a large market is essential to realizing a truly important industry), the following is the order of attack in attaining the various qualities indicated in our slogan.

Safety and ease of flying—Without this quality the general public will not fly.

Comfort—Again the public will not fly if uncomfortable.

Reliability—This, too, falls in the same class as the above.

Speed—This factor which may be classed as synonymous with aviation must initially be obtained to an extent, that is substantially above that of other means of transportation and must eventually reach levels far above what we now consider as possible.

Economy—First cost has quantity production as its predominant factor; quantity production means there is a market in existence, which market is obtained only when our airplane design incorporates the first four qualities.

Safety:

I feel that the most important item of safety is low landing speed. This involves low weight, large wing area and efficient wing section. Quantitatively I feel we cannot be satisfied with landing speeds of over 30 or possibly 40 miles per hour for the private owner plane.

Speeds of zero miles per hour as are approached in the Autogiro and may be attained in the helicopter are, of course, even better, and perhaps ultimately essential. In addition to low landing speed we must have perfect stability, almost foolproof control and general ease of flying now only approached in our better planes. In other words, the

(*Continued on following page*)

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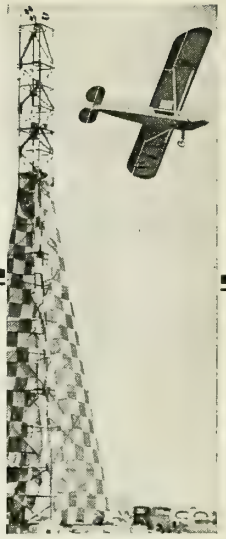
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The "Northern Star" is fully equipped with instruments, night flying equipment, safety belts, wash room and lavatory. Sale price with P. & W. Hornets, $20,000; with Gnome Jupiters, $15,000.

All four motors are in A1 condition, having been recently overhauled. The Hornets have had 110 hours and the Jupiters 50 hours. The fuselage was recovered last Spring and new tires mounted in June.

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(*Continued from preceding page*)

proportion which pilot errors bear to the total errors causing accidents must be greatly lessened. In addition to the above, such obvious requirements as the spin-proof plane and the plane which has control throughout its whole flying range are necessary of attainment.

As suggestions of innovations which are apparently headed in the right direction I would mention the Autogiro in some of its characteristics and the Tanager in many of its flying qualities.

Comfort:

I have enumerated the items requiring improvement such as elimination of vibration, noise, bumps and the improvement in ventilation, passenger accommodations, etc. I might also mention the disagreeable impression of dust on the public which is essentially an airport problem; nevertheless, the airplane can undoubtedly be improved in helping out the situation by additional departures than the obvious ones of universal use of tail wheels and the deflection of propeller wash.

Vibration may be lessened by the use of three-bladed propellers, with smoother airflows, by the gearing of engines and by the use of rubber-swung engine mounts. Exhaust noises can certainly be reduced, either by conventional mufflers or by mufflers of the interference type on which some effort has been expended. Geared-down propellers will lessen the noise from the propeller source.

The matter of bumps and air sickness requires far more attention than heretofore, the only real effort in its elimination which I have noticed being the recent Waterman plane which was fitted with oleo wing struts. Perhaps better design of seats incorporating shock absorbing mechanisms will also be helpful.

The problems of heating and ventilation should not be difficult to solve and in many transport planes quite satisfactory solutions have already been attained. The matter of accommodations is also receiving more attention than heretofore and should present no very difficult problems.

Reliability:

It goes without saying that complete structural integrity is essential. The severity of the problem involved in attaining such integrity is becoming more apparent as higher and higher speeds are obtained, as with such high speeds the possibility of overloading a plane possessing almost any specified load factor becomes possible for the pilot. This inter-relation of pilot judgment and strength of structure is not out of keeping, however, with a similar judgment required of the automobilist, so that it is not felt that too great a sacrifice in weight need be expended in obtaining unreasonably high load factors although we must have complete assurance that specified load factors are present.

Power unit reliability is becoming more and more satisfactory and in large planes the power plant reliability factor can always be enhanced by introducing multiple power units, if accompanied by suitable airplane design.

The problems of weather conditions are most closely allied to the work of the operator and ground personnel although our reliable airplane must incorporate the proper provision for lighting, radio and blind flying equipment.

Speed:

Velocity can be increased by increasing horsepower or by decreasing the coefficient of resistance, the area or size, and the air density.

The tendency has been to obtain greater speeds through the uneconomical method of merely increasing power. Effective increase in horsepower of some importance is obtained by improving propeller efficiency. More and more attention to the possibilities in this line, involved in the use of lower tip speeds, improved interference conditions, use of controllable pitch propellers and the selection of V/ND conditions of greater efficiency, is being given.

The more promising method, however, of obtaining speed increase, should be to decrease drag, the study of which will, it is felt, lead to extremely gratifying results. Correct steps in this direction are to be noted in the radial engine cowl ring; the prevalent use of fillets; the retractible landing gear; improved wing sections and the general trend towards the tapered flying wing. Quantitatively to attain the end believed essential we must increase our present airplane speed range, which now ranges from 2 to 2-3/10 to 4½ or 5. This sets a mark to shoot for which will test the ability of our engineers for at least two years!

Reduction in size in order to obtain increased speed can only be obtained economically by improving unit weights as we must not sacrifice landing speeds or passenger accommodations.

Very great promise may be held out for increasing speeds by flying at reasonably high altitudes with supercharged engines, a trend which will eventually bring us, in the transport class at least, to the plane flying at extremely high altitudes at tremendous speeds with supercharged engines and supercharged cabins.

Economy:

Of course, we must design to construct cheaply, but not at the risk of jeopardizing any of the previously described characteristics. I think the emphasis, however, should be placed on the economy which automatically comes in quantity production and that quantity production requires that our previously listed qualities be present in order to even get started.

We can, however, improve our airplanes from the production standpoint by carefully studying arrangement, material, type of construction, etc., best suited for each purpose. We may find, for example, that in the long run our aerodynamically efficient metal monocoque fuselage and all-metal wing will also be most economical to construct.

Solve the Problem

This is what the aeronautical engineer must do in the next two years. If he (collectively) follows the above or some similar logical method of attack I believe he can succeed. He must, however, find facts and fit them in to their proper relationship, reasoning deductively throughout. Too little attention to facts and too much attention to unsubstantiated talk by those who are not qualified to pass on the problems they were discussing has perhaps contributed most to the absence of a present solution which the opinions stated at the first of this article seem to show exists.

We must, then, obtain speed and then more speed, with accompanying safety, economy, reliability and comfort. We must produce a comfortable, reliable, full visioned, two- and four-seater airplane having perfect control and inherent stability to be sold at $2000.00 and $3500.00, and having a landing speed of 30 to 40 miles per hour with a top speed of at least 150 miles per hour.

This, I believe, represents the task which the aeronautical engineer must accomplish in the next two years in the field of commercial aviation in order to assure that his industry will be a truly important one.



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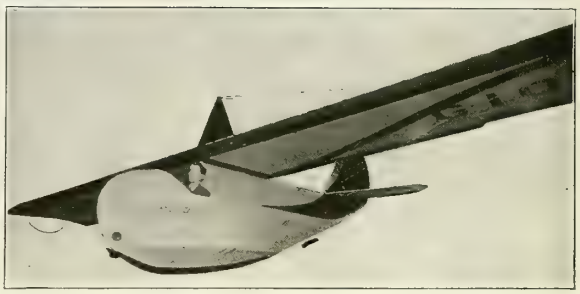
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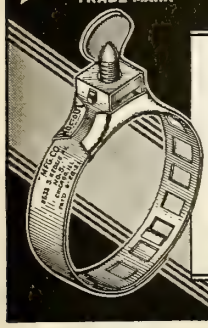
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CONNECTICUT—AN AVIATION LEADER

(*Continued from page* 45)

of applicants for pilot's licenses is only part of the duties and responsibilities of this Department. Supervision is a duty of equal importance and under the State Flight Surgeon and his associates, a system has been devised to keep the Department at practically all times in touch with those individuals holding Connecticut pilots' licenses. From a safety standpoint, it is quite as important to know a pilot's character and habits as it is to find him physically fit for flying. Under Federal requirements, if physically fit and able to meet the flying tests, a pilot is given his Federal license. At the end of six months for transport and commercial pilots, and at the end of a year for the other classes, indication of physical fitness and a certain minimum of flying is presented, and the Federal license is extended for an additional period. In Connecticut, the State licensed pilot is continually under supervision. Often a man physically fit and capable from other standpoints, because of certain traits of character or personal habits would be a menace to safe flying. These factors are carefully investigated by the Connecticut Personnel Department. Individuals with undesirable characteristics cannot obtain pilots' licenses in Connecticut—and if such traits develop, a pilot is immediately grounded.

In order to provide for such close supervision, it was found that sufficient properly qualified flight surgeons were not available. A mere knowledge of physiology is not sufficient to qualify for this work. A flight surgeon must be familiar with the problems of flying; he must appreciate the psychology of flying, and be a student of human nature. To meet this need, the State of Connecticut has established a School of Aviation Medicine. This school has a definite plan of instruction, and includes in its requirements a resident period at the U. S. Army Air Corps School of Aviation Medicine at Brooks Field, Texas, probably the best school of its type in the world.

The expansion of the work of the Personnel Department is shown in the increase from forty-one pilots registered in 1924-1925 to 319 for the year 1929-1930.

Patrol Work

The Connecticut Department of Aeronautics maintains control over the actual flying operations within the State by means of active patrol. In this work, as well as in the other functions of the Department, the state-owned Wasp powered Vought "Corsair" has proved invaluable. Having only one plane for all its duties, the Aeronautics Department has found the Corsair adequate for its purpose. In addition to the regular duties within the State, the Corsair has covered every state east of the Mississippi with the exception of two, and has been flown more than 50,000 miles.

In its patrol work, the Department of Aeronautics carefully follows the flying operations in the state, sees that flying regulations are adhered to, and that flying schools within the State are obtaining proper results from their flight instruction.

The results of this supervision, along with the inspection of planes and control of pilots, is shown by the safety record of the State. During the 1929-1930 year, a total of only forty-six accidents of any kind were reported. Of these, only four caused deaths, and of the planes figuring in these four fatal accidents, only one had a Connecticut licensed pilot in charge, the others being mail planes and other out-of-state ships.

Flying Facilities in State

In order to have safe flying in a state, proper flying facilities must be provided. As a whole, the State of Connecticut is rather difficult to fly over due to its hilly terrain. While it is not the function of the State to own airports, the encouragement and advice of the Aeronautics Department has resulted in a rapid expansion in the number of airports throughout the State.

Connecticut is probably as well "air marked"—that is marked with large signs which can be read from the air naming the community being flown over—as any state in the Union, and largely through the efforts of the Department of Aeronautics in encouraging the communities to proceed with that work. Hundreds of aerial surveys have been made to assist in selection of sites for airports and other aviation facilities, and the equipment and advice of the Department are always available to the municipalities and private owners in the establishment and maintenance of airports, etc. Extensive surveys have also been made with the idea of establishing a system of emergency landing fields throughout the State.

Education of the Public

Real progress has been made in the education of the public of Connecticut in aviation progress and the value of air travel. The personnel of the Department of Aeronautics, including Commissioner Knox and Deputy Commissioner Generous, have given freely of their time in addressing meetings and in other ways disseminating information on aviation.

Aviation Production

Due in some measure at least to the efforts of the Aeronautics Department, the production of aircraft, aircraft engines and accessories has risen from practically nothing in 1925 until the State of Connecticut now leads the country in the value of such products. Among the companies now located in Connecticut are Pratt & Whitney Aircraft Company, producers of the widely-used Wasp and Hornet engines; Chance Vought Corporation, builders of the Vought Corsair, used extensively in the Navy and Marine Corps Air Services, and in the air service of many foreign countries; Sikorsky Aviation Corporation, probably the largest manufacturers of amphibion aircraft in the country; the Whittelsey Aviation Company, and the Viking Aircraft Company. Besides these producers of aircraft and motors, some one hundred and fifty concerns in the state produce parts and accessories for aircraft.

New Projects

In addition to carrying forward the activities mentioned above, the Connecticut Department of Aeronautics, if properly supported by the State Legislature (and it always has been in the past, both by the Legislature and by popular vote of the people), intends to undertake the following projects: proper maintenance of "air marking" throughout the state; beginning a system of emergency landing fields by acquiring a few each year; and establishment of a state-operated "speed course" where all ships can be officially tested by manufacturers and owners. To handle these new projects and the expansion of the other functions of the Department, certain additional personnel, equipment and facilities will be required which will probably be provided by the State as soon as their desirability is understood.

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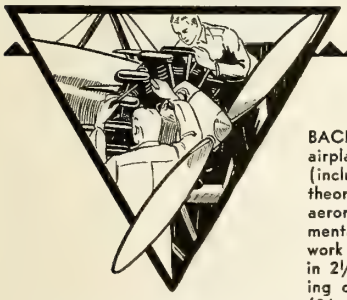


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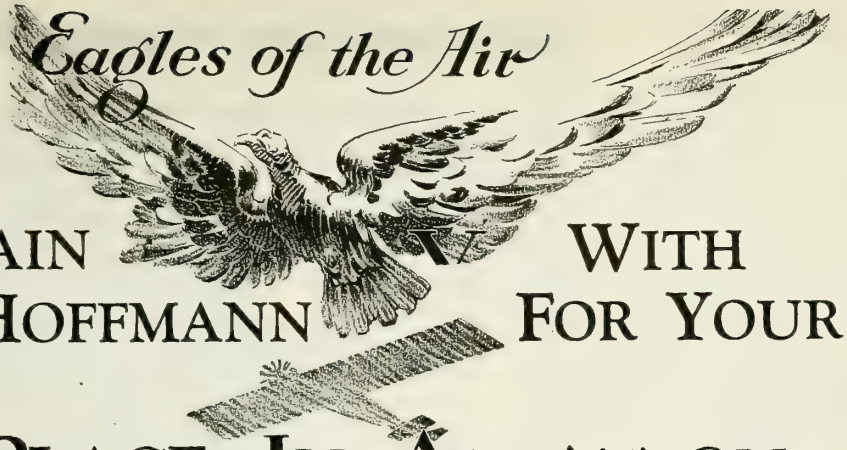
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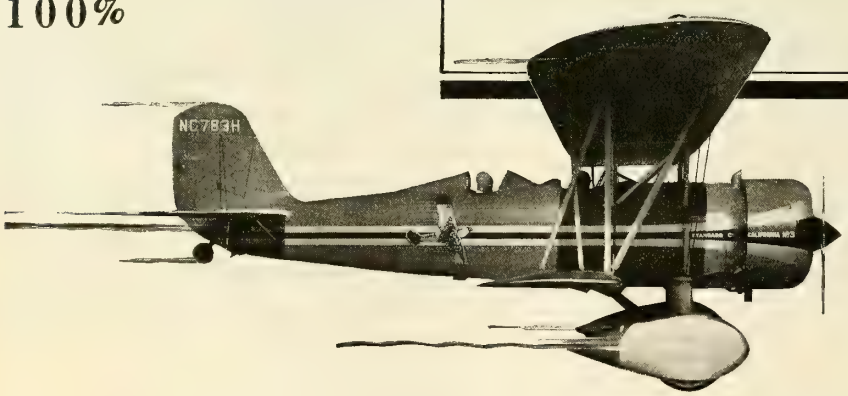
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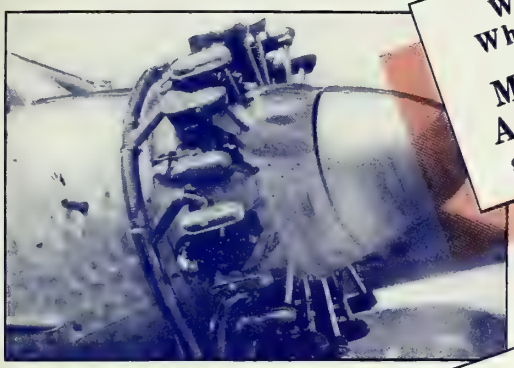
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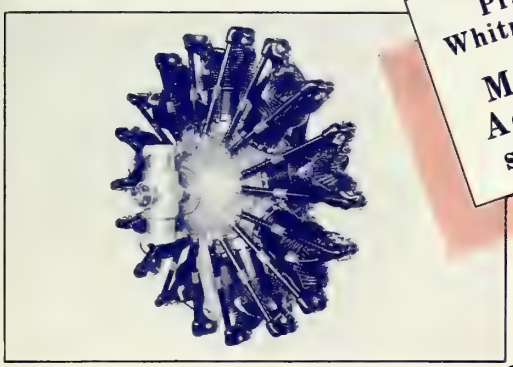
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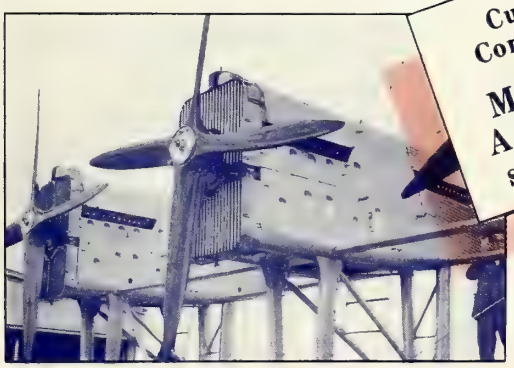
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